

A TEXTBOOK OF GYNÆCOLOGICAL SURGERY

BY

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I DEDICATE
THIS BOOK

TO

Those who have taught me and those I have taught

Those I have worked for and those who have worked for me

Those who have helped me and those I have helped

PREFACE TO THE SIXTH EDITION

THIS book, which is concerned wholly with the operative side of gynæcology, is a record of personal experience acquired at the Middlesex Hospital and Chelsea Hospital for Women, and the other hospitals with which I have been connected. In the four years which have elapsed since the fifth edition was published, the forward march of surgery has quickened in pace, and it is now necessary to include descriptions of the technique of pelvic exenteration and the radical operation for cancer of the vulva, besides making many smaller additions and numerous emendations.

In the preface to the first edition published forty years ago by Comyns Berkeley and myself the hope was expressed that the volume would be of service, on the one hand to those who were proposing to follow this department of surgery more particularly, and on the other hand to those who were of necessity called upon to perform gynæcological operations, and had not had opportunity for acquiring the ripe experience brought by long apprenticeship in the gynæcological wards and operating theatre. That hope, I have good reason to believe, has been realized to a very gratifying degree, and in presenting this sixth edition, 40 years after the publication of the first, I trust that it will prove still more useful to those for whom the book was originally intended.

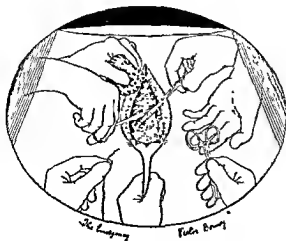
To my publishers I wish to express my thanks.

V. B.

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NOTE ON THE DRAWINGS

In order that a drawing of a pelvic operation may show clearly what the artist intends to convey, it is necessary for him to superficialize the parts concerned and thus make the procedure appear more easy than it is. For the same reason, in this series of drawings I have deliberately omitted all towels and wrappings except where they form the subject of the text.

V. B.



A TEXTBOOK OF GYNÆCOLOGICAL SURGERY

CHAPTER I

GENERAL OPERATIVE CONSIDERATIONS

THE SURGEON

"Send here the bold, the seekers of the way,
The passionless, the unshakeable of soul,
Who serve the inmost mysteries of man's clay"
Kipling

THE surgeon when operating should always remember that the character of the work of his subordinates will be largely influenced by his own bearing. While it is impossible to lay down definite rules suitable for all temperaments, nevertheless there are certain points of which a consideration will, we trust, prove as useful to those embarking on a surgical career as they have been to us.

Anyone who has taken the trouble to study the work of a number of operators cannot fail to have observed how variously the stress and strain of operating is borne by different minds, and will deduce from a consideration of the strong and weak points of each operator some conception of the ideal.

The keystone of the surgeon's bearing should be self-control and, while it is his duty to keep a general eye upon all that takes place in the operating theatre, and without hesitation to correct mistakes, he should be continually on his guard against becoming irritable or losing his temper. The man who, when confronted with a difficulty, gets irritable and unsteady has mistaken his vocation, however dexterous he may be, or however learned in the technical details of his art. The habit of abusing assistants, the instruments, or the anæsthetist, so easily acquired and with difficulty lost, is not one to be commended; the mental incertitude of which such behaviour is the indirect expression will inevitably spread to the other members of the staff, so that at the very time when the surgeon is most in need of effective help he will find it fail him.

The assistants should be encouraged to look forward to each operating day as one of strenuous but pleasurable work, but this object will not be attained if constant fault-finding forms part of the routine. It will also be well for the surgeon to remember that his bearing will be the subject of keen criticism by the spectators, and that there is nothing so much admired as fortitude in adversity. On the other hand, he must avoid any temptation to "play to the gallery," for sooner or later such conduct will be detrimental to the patient. A surgeon should not gossip, for it is impossible for him to do his best work if he is continually engaged in irrelevant chatter; but a silent surgeon is unprofitable to those around him, for he should clearly outline the steps of the operation as it proceeds, and by apposite and instructive remarks compel the attention of those who are there to learn. It is the mark of a good operator to become more and more silent as the difficulty of the operation increases, of a bad one to become more loquacious.

It falls to the lot of every surgeon, when operating, sooner or later to stand face to face with threatened disaster, and even for the most expert and confident there must be moments when the heart sinks. On such occasions the operator should remember that, if he does not hesitate, the deliberate and vigorous application of general surgical principles will nearly always, temporarily at any rate, surmount the difficulty, while half-hearted and nervous measures merely increase it. A sturdy belief in his own powers and a refusal to accept defeat are the best assets of a calling which pre-eminently demands moral courage.

Before operating, the surgeon should go over in his mind the various possibilities of the projected procedure, so that he may be the better able to meet them. Likewise, after the operation he will find it profitable to recall the difficulties he has encountered and the technique he adopted in surmounting them, for it is only by cultivating a habit of self-examination that his workmanship will continue to improve.

In hospitals it necessarily happens that a very large amount of work must be got through in a single operating day, but it is a grave mistake to undertake more work of an arduous nature than the physique and mind of all concerned can fairly tolerate. Operations performed when everybody is tired out are ill done; the surgeon's hand and mind become less steady, his assistants are less apt, the nurses are less careful, and the patient's nervous system is exhausted by long waiting.

The surgeon will do well to bear in mind that until the day of his retirement he should steadfastly seek to improve his technique, for he may rest assured that he will never be perfect, and that there is some good lesson to be learnt from seeing the work of any operator, even if it be only what to avoid. Self-satisfaction is a deadly enemy to progress.

Lastly, nothing is so contemptible as publicly to decry the work

SPEED IN OPERATING

Speed as the outcome of perfect operative technique is a characteristic of a fine surgeon, as a striving after effect is the stock-in-trade of a showman. An operation rapidly yet correctly performed has many advantages over one as technically correct yet laboriously and tediously accomplished. The period over which hæmorrhage may occur is shortened, the tissues are less bruised, the time of exposure of the peritoneum in abdominal section is minimized, the dose of the anæsthetic with its attendant evils is reduced, and shock, which is the expression of all these factors, is lessened. Moreover, less strain is thrown upon the temper and the legs of the operator and his assistants, and the interest of the latter and of the onlookers is maintained at its highest level.

There are, however, two aspects of rapid operating which must not be overlooked. The first is the fact that there is a much greater liability to oozing after the operation has terminated; for when a surgeon has taken two hours to perform an operation, any recurrent bleeding, if it is going to occur, will have declared itself in that time; whereas, had the wound been finally closed at the end of half an hour, the opportunity of discovering the bleeding might have been lost. It is for this reason that the results of the brilliant surgical prodigy and of the laborious plodder are not always so different as at first sight might be expected, since the after-results due to mauling and exposure of the tissues by the latter are, in the former, balanced by the local reaction and fever set up by post-operative oozing.

The second aspect, of equal importance, turns on the fact, not generally appreciated, that the amount of shock produced by an operation depends not only on the amount of operative trauma that its performance entails, but also on the time over which that trauma is spread. That is to say, a given amount of tissue damage will be better borne by the patient if it is spread over a long time than if it is inflicted suddenly, and a given loss of blood will be less felt if its escape occupies, say, an hour rather than ten minutes.

Hence a surgeon whose rapid but rough operating merely succeeds in bestowing on his patient in twenty minutes the same amount of shock impressions as his slower colleague would bestow in an hour, loses by his rapidity, whereas the quickness of the operator of real

outstanding excellence effects not merely a saving of time but a diminution of shock impressions in still greater proportion.

Rapid operating, then, should be acquired only as the result, of continual practice and constant thought as to how best to reduce the number of manipulations required and the shock impressions resulting from them to that minimum which, taken in relation with the time over which they are spread, gives the best immediate results to the patient without sacrificing the final efficiency of the operation. Thus obtained, speed is an attribute in the highest degree to be desired and striven for.

There are occasions when the condition of the patient warrants the omission of certain steps from the perfect technique of the operation for the sake of shortening it, but habitually to achieve speed by imperfect technique is poor surgery.

It is impossible to lay down any rules as to time for the various operations dealt with in this work, so much depending upon the nature of the case and the circumstances in which they are performed, for an operation which may take only thirty minutes with full hospital assistance may take double that time when performed with a single assistant in a private house. Given good conditions, we find that all of them, with a very few exceptions, can be performed well under an hour, and most of them under half an hour.

OPERATIVE MANIPULATION

The surgeon should continually endeavour to reduce the number of manipulations required in a given procedure to the minimum consistent with its proper performance. Anyone who will take the trouble attentively to observe the performance of an operation cannot fail to be struck by the number of unnecessary movements made. This wastage of time and effort cannot, of course, be entirely abrogated, much of it being the expression of the wavering intentions of the operator in the face of new difficulties continually presenting themselves. Nevertheless, some part of it is due solely to bad habits and a lack of determination on the part of the surgeon to subject his movements to self-examination, and to improve upon them whenever possible. Thus, to perform the primary incision through the abdominal skin and fascia by a series of niggling cuts is an example of bad technique, as is the practice of passing a needle with a forceps, removing and laying down the forceps, and then extracting the needle with the fingers of the left hand. The needle should, of course, be extracted with the forceps and the two returned to the instrument table together.

These examples might be multiplied many times, but they will suffice for the purpose we have in view. Manipulations should be

conducted with the finger-tips ; there is nothing so inelegant as to see the surgeon's hands sprawling over the operation area, obstructing not only the spectators' view but his own. It is better, whenever possible, to keep the hands entirely out of the wound by performing the necessary manœuvres instrumentally.

All operative manipulation should be gentle. Rough handling of the tissues greatly increases the shock of an operation, and should be strictly avoided whenever possible. There are occasions when the surgeon is obliged to use a certain amount of force as, for instance, when disengaging a very firmly impacted tumour from the pelvis. By one experienced, however, considerable power may be brought to bear which, because it is exercised in the right manner and only for a short time, is not harmful to the patient. A surgeon who is habitually clumsy and heavy-handed is subjecting his patient throughout the operation to unnecessary shock impulses.

CHAPTER II

SURGICAL TECHNIQUE

INSTRUMENTS

THE aim of the surgeon should be to use as few instruments as is compatible with the efficient performance of the operation he is engaged upon. There are many reasons for this. The fewer instruments a surgeon has, the more uses he learns to put them to, and he is thus able to save time in immaterial details of the operation which can be profitably expended on its essential features. Thus, a Spencer Wells pressure forceps may be efficiently used for hæmostasis, as a retractor, as a needle-holder, as a dissecting forceps, as a probe, and as a swab-holder. The surgeon who is accustomed to make one instrument serve many purposes is likely to maintain his self-reliance, no matter what the nature of the operation or the circumstances in which he is called upon to perform it, while one whose habit it is to use a special instrument for every separate manœuvre may become worried and unreliable when it is not forthcoming.

In choosing his instruments, a surgeon should, therefore, have these points in mind, and limit, so far as possible, the number of those which are restricted to a single manœuvre, and should remember that a fictitious value has often been and will again be given to some instrument solely on account of the halo surrounding its inventor's name. It has been our experience that those who are too much dependent for the standard of their work on special instruments and apparatus often lack the manipulative skill and ready resource which are the characteristics of the surgeon by grace of nature. Complicated instruments should be avoided whenever possible for, however well they may work in the instrument-maker's shop, they soon get out of order from the wear and tear of boiling. In the long run it is cheapest to use instruments of the best stainless steel and of the finest workmanship, for though their initial cost is greater, they last longer and are not likely to fail at some critical moment. Instruments, we would add, should be kept in perfect order, for such defects as sprung forceps, loose-jointed scissors, and blunt knives, though not very noticeable in a straightforward operation, become painfully apparent when the difficulty and strain of the case test every joint of the surgeon's armour. Simplicity,

then, in instruments, as in other things, should be the key-note of the operation, but simplicity with efficiency. *In medio tutissimus ibis*: an outfit so large as to require for its conveyance a bag resembling a sea-man's chest is ridiculous; one so small that it can be carried in the trousers pocket is dangerous.

The following are the instruments we use:

Scalpel.—Scalpels with removable blades are the most convenient. The blades should be stored in methylated spirit and the handle boiled with the rest of the instruments.

Forceps. Dissecting.—Dissecting forceps should be 7 inches long for use in the bottom of the pelvis; the whole of the last inch of the



Fig. 1.—Donney's dissecting forceps.

jaws should approximate and be grooved transversely, for the convenient seizing of needles and masses of tissue; and their points should be rat-toothed to give a better hold in manœuvres requiring delicacy. The instrument shown in Fig. 1 fulfils these requirements.

Spencer Wells.—Two sizes are required, 5 inch and 7 inch. The jaws should approximate before the ratchet locks, so that it is possible to seize small objects without clamping them.



Fig. 2.—Curved Kocher's forceps.

Kocher's.—These forceps are of a similar shape to the Spencer Wells, but their jaws are longer (2 inches) and their ends are furnished with rat-teeth. They are particularly convenient for holding masses of tissue firmly as, for instance, when clamping the uterine arteries on the side of the uterus. We use two sizes, 5½ inches with straight jaws, and 8 inches with curved jaws (Fig. 2), the latter being very useful for panhysterectomy and the radical abdominal operation.

Ring forceps.—These should be 10 inches long (Fig. 3), and they are perhaps the most generally useful forceps in the whole outfit, for they are admirable for securing and tying bleeding-points deep down in the

pelvis when the vessel is enclosed by surrounding tissues and not isolated, and for steadying and pulling up diseased appendages, while they make very good bowel clamps, and can be used for emptying the uterus or for holding swabs.

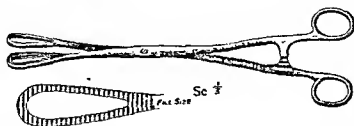


Fig. 3.—Ring-forceps.

Round-ligament forceps.—The forceps shown in Fig. 4 are required for the operation of intraperitoneal shortening of the round ligaments.



Fig. 4.—Round-ligament forceps.

Towel forceps.—For attaching the sterilized towels to the skin we use forceps with curved pointed grips. They are small and equally suitable for use in all situations.

Moynihan's towel forceps.—We use these to attach sheet rubber to the edges of the abdominal wound.

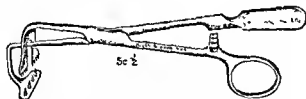


Fig. 5.—Gray's towel forceps.

Gray's towel forceps.—This instrument is admirable for fixing rubber or Jaconette sheeting to the pubic end of the abdominal wound, and also excellent for fixing it at the upper end provided the incision does not extend to the umbilicus (Fig. 5). When it does we use an ordinary towel forceps.

Willett's forceps.—These forceps, originally designed to grip the scalp of the child in cases of placenta prævia, are used by us to extract the head in the lower-segment Cesarean section (Fig. 6).

Ovum forceps.—These are used for evacuating an early pregnancy from the uterus *per vaginam*. They are particularly useful in getting hold of the head of the fœtus (Fig. 7).

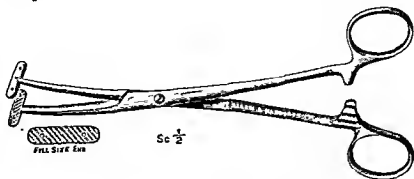


Fig. 6.—Willfett's scalp forceps.

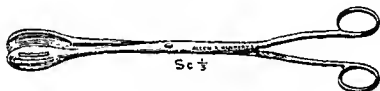


Fig. 7.—Ovum forceps.

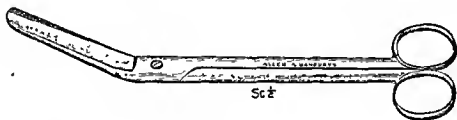


Fig. 8.—Blunt scissors bent on the flat.



Fig. 9.—Mayo's scissors bent on the flat.

Scissors.—For gynaecological surgery the scissors should be 7 inches long. Five types are required: those with straight blunt-ended blades, those with blunt-ended blades bent on the flat, those with straight blunt-pointed blades, those with blunt-pointed blades bent on the flat, and those with blunt-pointed blades set at an angle to the plane of the shanks. The last three types are variations of Mayo's pattern. To

these should be added Bonney's single-handed scissors, which can be held in either hand, leaving the thumb and the index and middle fingers free (Figs. 8, 9, 10, 11).

Volsellum.—The best-pattern is Fenton's 'bull-dog' volsellum. It is 7 inches long, and effects a very firm hold (Fig. 12).

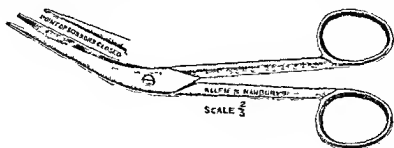


Fig. 10.—Mayo's angular scissors.

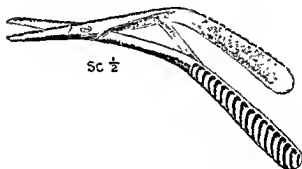


Fig. 11.—Bonney's single-handed scissors.

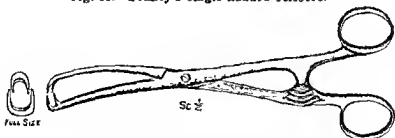


Fig. 12.—Fenton's bull-dog volsellum.

Retractors. Abdominal.—We have tried various patterns on the market, and find the two most generally useful to be the gloved hand and a self-retaining form we have designed (Fig. 13). This instrument consists of two parallel bars and a cross-bar, the latter being fitted with a ratchet to fix the parallel bars at whatever distance apart the operator desires. The blades, which are detachable, are made in three sizes, suitable for ordinary cases, very fat patients, and unusually small incisions respectively. To each blade is affixed a device by means of

which a piece of sheet rubber can be attached to the blade so that when the retractor is in position the whole thickness of the cut abdominal wall is protected from infection.

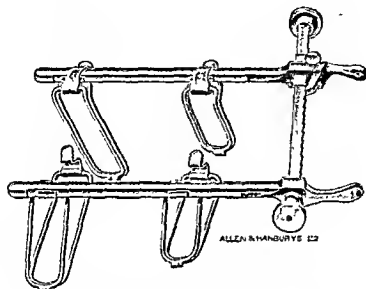


Fig. 13.—Berkeley-Bonney retractor showing long and short blades.

The retractor, like all the self-retaining instruments of a similar pattern, requires to be used gently. Forceful retraction tears the peritoneum and bruises the muscles.

Single-bladed.—For holding back the bladder in total hysterectomy and Wertheim's operation, we use the pattern shown in Fig. 14. The blade measures 4 inches by 2 inches.

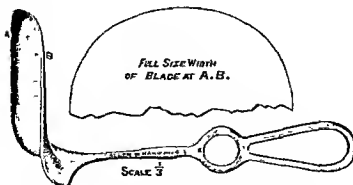


Fig. 14.—Broad-bladed retractor.

Vaginal.—Auvard's weighted speculum (Fig. 15) is a necessity for the proper performance of vaginal surgery. It should not be made

unnecessarily heavy, as it is apt thereby to tear or bruise the soft parts. The operator must remember that should it slip out of the vagina it will break any china receptacle that may be underneath it

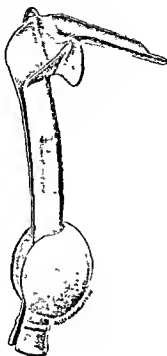


Fig. 15.—Auvar's speculum.

In minor operations on virgins the use of Auvar's speculum is undesirable or impossible without lacerating the vagina. In such cases we prefer to use a narrow vaginal retractor to be held by the hand



Sc. 4

Fig. 16.—Narrow-bladed retractor.

(Fig. 16). This retractor is also usefully employed to hold back the bladder and anterior vaginal wall in vaginal hysterectomy and other operations involving the vaginal vault.

Berkeley's vulva retractor.—This instrument is very useful for retracting the lateral margins of the vaginal entrance, especially when the surgeon is short of assistants (Fig. 17).*

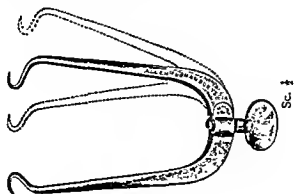


Fig. 17.—Berkeley's vulva retractor.

Clamps. Vaginal clamp.—We devised many years ago the instrument shown in Fig. 18 to clamp the vagina preparatory to its section in Wertheim's operation.† The shanks are bowed so as to include the uterus without compressing it, and are provided with two pairs of finger-rings, the lower of which are used for adjustment, while the upper are used when clamping the vagina.

This clamp secures a very firm hold, minimizes the risk of injuring the ureter, and allows direct traction upwards on the vagina.

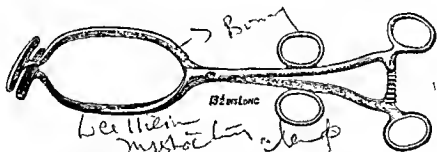


Fig. 18.—The Berkeley-Bonney vaginal clamp.

Bonney's myomectomy clamp.—This instrument was designed to control the blood-flow through the uterine arteries and that coming up through the cervix from the vagina during the performance of myomectomy.‡ It is applied from the front with the blade-shank angle undermost, though it can be reversed if this appears more convenient. It should be made to grip the body of the uterus just above the cervix, and it is best to include both round ligaments in its grasp, for otherwise it is apt to slip down below the level of the uterine arteries, in which case the blood-flow is not controlled. The grasp should be as strong as possible, for such is the freedom of the anastomosis through the

* *Journ. Obst. Gyn. Brit. Emp.*, Vol. XXX, 1923.

† *Brit. Med. Journ.*, Oct. 3, 1908.

‡ *Journ. Obst. Gyn. Brit. Emp.*, Vol. XXX, 1923.

cervix that compression of the uterine arteries only will not cut off all blood coming to the uterus from below; the vessels in the cervix must be compressed also. Ring-forceps are then applied to the ovario-pelvic ligaments to compress the ovarian arteries, with the result that the operation becomes practically bloodless. It will be found that, as the enucleation of the fibroids proceeds and the bulk of the uterus lessens, the clamp will need tightening. When the clamp and ring-forceps are taken off, the uterus flushes up temporarily just as a limb does after the removal of a tourniquet. The flushing is quite temporary (*see* p. 395). It has been suggested that the clamp might damage the uterine vessels, but this is not the case, as we have proved after using it many hundred times. Two pairs of finger-rings are provided, the lower pair for use when adjusting the instrument and the upper for clamping it and for taking it off (*Fig. 19*). A piece of rubber tubing should be placed over each blade.

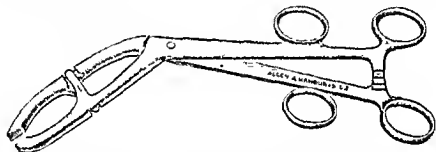


Fig. 19.—Bonney's myomectomy clamp.

Intestinal clamps.—The ring-forceps already described make very efficient bowel clamps when end-to-end anastomosis has to be performed. For lateral anastomosis they are useless. We, therefore, always carry a pair of the clamps illustrated in *Fig. 543*, their blades being $4\frac{1}{2}$ inches long. These clamps may be also very conveniently used in place of Playfair's probe in minor operations on the uterus.

Enterotribe.—For crushing the colon as a preliminary to dividing

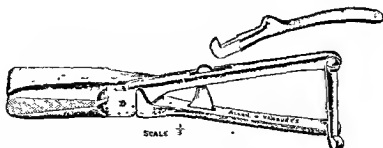


Fig. 20.—Bonney's enterotribe.

it and inturning the ends, the instrument designed by Miles and modified by one of us is very efficient (*Fig. 20*).

Needles.—For forty-five years we have used curved needles of the pattern originally designed by one of us (V.B.). They have the great advantage that they can be firmly held at any angle in a pressure-forceps; they are also easy to thread and difficult to blunt. The front half of the haft of the needle is bayonet-shaped, with sharp-cutting edges, while the hinder half is flat with an oval eye. For through-and-through sutures they are made 5 ins. long.

For suturing the skin wound, 4-inch bayonet-ended needles are required. For intestinal work, Souttar's needles with the suture attached are by far the best. They are made in various patterns.

Needles should be carried in a small perforated metal box in which they can be sterilized.

Handled needles. Reverdin's needle.—For many years now we have largely given up the use of ordinary needles in place of Reverdin's needle with the slide-closing eye. The instrument has many advantages when used in conjunction with Bonney's wrist-reel, whereby the ligature and suture material is carried on the wrists so that the operator and his assistant become "self-contained" and the banding up

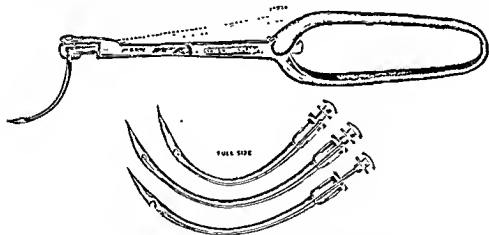


Fig. 21.—Bonney's pattern of Reverdin's needle.

of needles ready threaded by a second assistant is avoided. One needle of appropriate size suffices for any ordinary operation, and it is placed adjacent to the surgeon's hand so that he has no need to ask for it. Being of very much stouter material than an ordinary needle, it enables the surgeon to get a certain amount of leverage on the tissues, whereby the passing of sutures or ligatures in difficultly accessible positions is rendered easier. The best pattern is that devised by one of us, which allows of the needle being set at various angles to the bolder (Fig. 21). The drawback to Reverdin's needle is that it is a delicate instrument requiring attention if it is to be kept in working order. After use it should be first washed, then boiled, and then put into spirit to dehydrate it, after which it should be rubbed with oil and put away. The slide should never be entirely withdrawn.

Worrall's needle.—The notched needle designed by Worrall (Fig. 22) is an extremely useful instrument when working in a position difficult

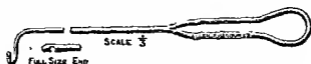


Fig. 22.—Worrall's handled needle.

of access, such as the depth of the pelvis in a radical abdominal hysterectomy, or high up in the vagina in vaginal hysterectomy.

Michel's clips.—We shall refer to the advantages of these (p. 294). The best apparatus for applying them is that shown in Fig. 23, in which the application-forceps is furnished with a bridge on which the clips

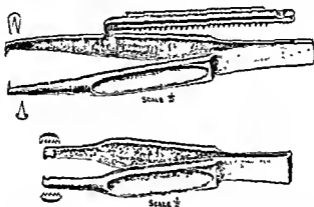


Fig. 23.—Above, Berkeley's forceps for carrying Michel's clips; below, Berkeley's forceps for applying them.

are carried. Michel's clips should be made of soft material, when they are easier to apply and more efficient. We think we have improved on Michel's original pattern by having the clips made double the breadth with two spikes on either side instead of one.

Braithwaite's pattern of clip-remover is the best, especially if the double clips referred to are used (Fig. 24).

Bonney's wrist-reel.—This device enables the surgeon and his assistant to carry the necessary supply of ligature and suture material on their wrists, and does away with the necessity of its being handed up to them by a third party. It was designed specially for use with Reverdin's needle. It will be found most convenient for the surgeon to wear his reel on his left wrist while the assistant wears his on his right wrist (Fig. 25). Both the surgeon and his assistant should be proficient in the single-handed knot. The catgut we use is ready wound by the makers on reels of suitable size in lengths of 10 to 15 feet.

Ligature box.—The most convenient apparatus for keeping ligatures on the instrument table is a metal box containing three reels, so arranged

that the threads can be withdrawn without exposing the whole reel. This metal box may be boiled with silk or thread ligatures remaining *in situ*, but reels of catgut must be put in afterwards.



Fig. 24.—Braithwaite's clip-remover.

Glove box.—Rubber gloves are usually sterilized by steam, but circumstances may need them to be boiled, and if they are boiled with the instruments they are very likely to be perforated. To obviate this,

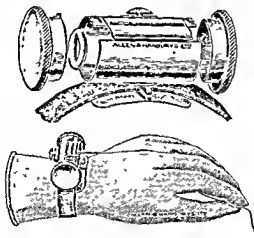


Fig. 25.—Bonney's wrist-reel.

and to save the time wasted by two separate boilings, a perforated metal box to contain the gloves during sterilization and transport is useful.

Sounds.—The ordinary uterine sound is necessary, while for the bladder a bladder sound is required.

Dilators.—Fenton's dilators are excellent because they are double-ended, so that the number of instruments required to be carried is halved; moreover, the curve on the instrument facilitates their

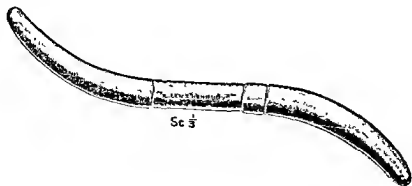


Fig. 26.—Fenton's uterine dilators.

introduction. Owing to the leverage obtained by their length they are very powerful instruments, and must be used with caution (Fig. 26).

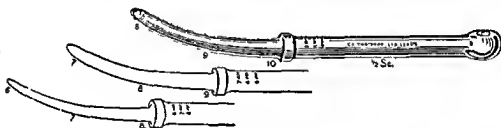


Fig. 27.—Bonney's Improved cervical dilator.

One of us (V.B.) has recently introduced an improved form of dilator in which the dilating part is cone-shaped, the diameter of the central point of each cone being the diameter of the extremity of the cone next above it. The result is an intermittent wedge which makes dilation much easier and safer. Since it is only the cervix that needs dilating, the dilating portion of each dilator is made only 3 inches long, thereby greatly diminishing the chances of perforating the uterus (Fig. 27).

Curette.—We always use for gynæcological operations the flushing curette shown in Fig. 28. It is unnecessary for the blade to be a greater breadth than $\frac{1}{8}$ inch, and this can be passed into the uterus easily after a dilatation to No. 9 Fenton.

For curetting the cervix, our practice is to use a sharp scoop.

Clover's crutch.—If a proper operation table is available, the patient is ordinarily retained in the lithotomy position by poles and foot rests but when such are not available, Clover's crutch should be used.



Fig. 28.—Flushing curette.

In cases of emergency, when such a crutch is not available, a fairly good lithotomy position is obtained by placing a well-padded walking stick under the knees, and then pulling up the thighs towards the abdomen by means of a roll of bandage, tied to each end of the stick and passed over one shoulder and under the other.

Cautery.—A well-equipped operating theatre will comprise both diathermy apparatus and an electric cautery, but in the absence of these Paquelin's cautery is efficient. As supplied by instrument makers, however, it is an expensive instrument and that sold for doing "poker work" will serve the same purpose at much less cost.

Infuser.—A simple apparatus for saline venous infusion should always be kept in the operator's bag, for he may be called upon to

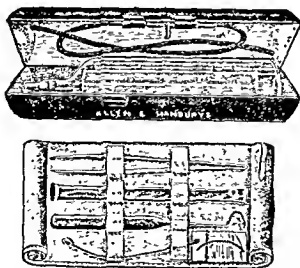


Fig. 29.—Berkeley's saline infusion outfit.

perform this operation at any moment and the more elaborate modern apparatus may not be available. That shown in Fig. 29 will be found very convenient.

Apparatus for testing the patency of the Fallopian tubes.—For testing the patency of the Fallopian tubes from the vagina we use the



Fig. 30.—Bonney's apparatus for inflating the tubes.

apparatus shown in Fig. 30, by means of which air is blown through the tubes. The nozzle of the apparatus is a hollow dilator which fits the cervical canal so tightly that air is not able to escape by the side of the nozzle. For testing the patency of the Fallopian tubes from their ampullary ends we use the small bulb inflator shown in Fig. 31.

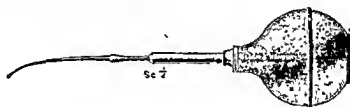


Fig. 31.—Bonney's abdominal inflator.

Uterine compressor.—For rendering avascular the uterine incision in the lower segment when performing Casarean section, the compressor



Fig. 32.—Bonney's uterine compressor.

shown in Fig. 32, which was devised by one of us, will be found very efficient.

SUTURE AND LIGATURE MATERIAL

Sutures and ligatures may consist of silk, thread, silkworm (or nylon) gut, or catgut. The relative advantages of these materials may be discussed under five headings: ease of sterilization, strength, security, absorbability, cost.

Ease of sterilization.—The only material that runs any risk of being inefficiently sterilized is catgut, for the other three substances are not injured by boiling. The absolute sterilization of catgut is a matter of great difficulty. Bulloch showed that the only reliable method is treatment by an aqueous solution of iodine and potassium iodide for 8 days, used in such a way that the catgut absorbs 12 per cent. of its weight of iodine. The destruction of sporing organisms derived from the intestine of the animal from which it was made, and deeply placed in the catgut, is the greatest difficulty.

How extraordinarily resistant is catgut to permeation by an antiseptic may be illustrated by an experiment made by one of us. A hank of catgut was immersed for 3 months in "Violet-green" (see p. 31). At the end of that time a portion was placed under a dissecting microscope and "teased out." The centre fibres were entirely unstained! On culture it was found to be still heavily infected. Bulloch asserted that of a large number of commercial catguts bought by him in the open market not one batch was absolutely sterile. Fortunately the sporing organisms contained in imperfectly sterilized catgut are rarely of high pathogenicity, and no doubt the tissues can, as a rule, deal with them, but they are probably responsible for the "catgut blisters" which sometimes appear in the second week after an operation in which catgut was buried (see p. 874). Tetanus, however, is a much more serious matter and there can be but few surgeons of large experience who, in the course of their career, have not seen a case of catgut tetanus. It behoves a surgeon, therefore, to use the greatest discrimination as to the catgut he employs (see p. 863) for its sterilization is quite beyond the scope of a surgeon or theatre sister.*

Strength.—The strongest material for its size is silkworm and nylon gut; after it thread, then silk, and lastly catgut.

Security.—The knots of catgut are apt to become loose owing to its slippery surface and pulpy nature. Silkworm-gut, and to a lesser extent thread, also share in this disadvantage. Nylon gut slips badly unless the surgeon's knot (p. 40) is used. A silk knot is the most secure.

Absorbability.—Silkworm-gut is never absorbed. We have removed it apparently unchanged at the end of many years. Silk and thread are undoubtedly absorbed, though slowly, unless so thick that encystment by fibrous tissue occurs before the process is complete.

With regard to silk, it is difficult to say where the line can be drawn

* Tetanus can also follow the use of imperfectly sterilized dressings.

between absorption and encystment, but we believe that No. 2, at least, is completely absorbed after about a year's residence in healthy tissue.

Catgut is absorbed perfectly in healthy tissue, the time depending on the method by which it has been prepared and the character of the tissue in which it is implanted. This latter fact is of importance, and it should be remembered that a catgut which takes 10 days to absorb in the subcutaneous tissue may disappear in half that time when implanted in peritoneum or muscle. For this reason it is in general safer, and in certain situations, such as the cervix after its partial amputation, much safer, to use catgut which has been prepared to resist absorption by the subcutaneous tissues for 20 days.

In areas of suppuration, fortified catgut is absorbed no more than silk or thread, for the phagocytic action of the tissue cells is in abeyance. Unfortified catgut, however, does soften and disappear, owing to the tryptic action of the pus.

Cost.—Simple linen thread is the cheapest of all, then silk, then nylon gut and after these silkworm-gut, and lastly catgut, which, owing to the long preparation required, is the most expensive.

Conclusions.—Silk has many advantages and one great disadvantage. It is strong, its knot is secure, its sterility can be ensured, its cost is reasonable, and the same reelful can be used several times over. Its great disadvantage (except in very small sizes) is that it is not absorbable, so that months or even years after the operation in which it was used an abscess may develop round a piece of it.

What we have said of silk applies equally to thread, with the addition that, owing to its great strength and thinness, it is more likely to cut through the tissues, and on account of its smooth surface the turns of the knot may fail to bite, so that it is apt to slip.

We limit the use of silkworm and nylon gut to deep retaining sutures or circumstances in which absorption of septic material along a suture is to be feared. When it is desired to retain sutures for 2 or 3 weeks, as in some cases of vesico-vaginal fistula, silver wire may be employed.

As regards catgut, we use that manufactured under the name "Chorda," having previously tried a number of brands and found none of them entirely satisfactory. Since we took to using this catgut, "catgut blisters" have very largely disappeared, whereas before that they persisted in occurring every now and then and occasioned us much annoyance and anxiety. For general use, size 1, with an absorption rate of 20 days, is the best. Unfortified catgut we use only in certain situations where rapid absorption has no disadvantage, as, for instance, to sew up subcutaneous fat or the mucosa of the bladder.

To sum up—our own practice is to use silk in "clean" cases for

main ligatures in situations not exposed to a risk of deferred infection. Catgut we use for all plastic work, for closure of the peritoneal and fascial layers of the abdominal wound, for coapting peritoneal flaps and burying stumps, and for all ligatures when the operation area is already infected, or subsequent infection is likely.

We prefer catgut prepared on reels rather than in hanks; the latter are sometimes troublesome to disentangle and in the process the strand may wander beyond the sterile precincts in which it is being handled.

When a very firm and lasting union between two sutured surfaces is desirable, silk of fair thickness (No. 4) should always be used, because the presence of the unabsorbable, or with difficulty absorbable, suture or sutures stimulates the neighbouring tissues to the production of a dense fibrosis, which welds the parts together, whereas catgut does not remain long enough to effect more than "postage stamp" adhesion. Thus the sutures used for ventral fixation and for anchoring the round ligaments in the operations for retroversion should be of silk. The use of catgut is responsible for most of the relapses after these operations.

SWABS

Material.—We think that the most suitable material out of which to make abdominal swabs is Gamgee tissue or absorbent wool covered with gauze. Such materials can be sterilized at very short notice by boiling or steaming, can be made into swabs of any size, and are easily obtainable.

For abdominal operations two sizes are required: 10 inches square, for packing off the intestines, and 5 inches square, for purposes of swabbing. These are best made of Gamgee tissue cut a little larger than the size required, with the edges turned in and sewn over. In hospital practice, for the sake of cheapness, pieces of wool similarly cut and covered with white gauze sewn over at the edges may be used.

For vaginal operations the swabs must be small, about the size of a double walnut, and are most quickly made by tying up a piece of wool of that size in an outer covering of white gauze; or they may be made of four layers of gauze, 5 inches square, sewn over at the edges.

Sterilization of swabs.—Swabs are best sterilized by steam, for, remaining dry, their absorptive power is not diminished. When steam sterilization is not obtainable they should be boiled for one hour and then transferred to 1-in-1,000 biniodide of mercury solution until they are required, when they must be wrung out in sterilized water. Wet swabs are much less absorptive than dry ones, and hence, in order to work with a practicable number, they must be washed over and over again in sterilized water as the operation proceeds.

Number required.—For vaginal operations, two dozen of the small swabs described will usually suffice.

For vaginal hysterectomy at least three dozen are necessary; and in addition two larger flat ones, similar to those described for abdominal operations, but measuring 4 inches square, to which a piece of tape has been sewn, are needed for introduction into the pelvic cavity to prevent prolapse of the bowel and omentum into the vagina.

For abdominal operations the number required will depend upon whether the surgeon cares to have the swabs repeatedly wrung out in the course of the operation, or prefers, once having soaked a swab, to lay it aside.

The first method has the advantage that a smaller number is needed, whereby the danger of leaving one in the peritoneal cavity is minimized and expense and labour are lessened; but, on the other hand, it involves more handling of the swabs and a greater risk of infection, while to perform the operation as expeditiously an extra nurse is required to wring them out.

The second method requires a greater number of swabs, but the superior absorptive power of dry wool over wet obviates the necessity of using an embarrassing number.

We find that for all ordinary abdominal operations 12 is a sufficient number, 2 of the large size described and 10 of the small

For extensive procedures such as Wertheim's operation, double the number of the smaller size is needed.

For convenience of counting, the small dry swabs should be made up in packets containing five each. At the outset of the operation one of the large swabs and two packets of the small should be opened, nor should fresh packets be opened until each swab of those first put out is thoroughly soaked through. If, however, the first method be employed, namely, to wash out the swabs in the course of the operation, 8 only are required in all, 2 of the large size and 6 of the small. Of the two methods, we much prefer the second.

The importance of carefully counting the swabs before and after the operation is insisted on elsewhere. Some surgeons, to prevent a swab being left in the abdomen, have a piece of tape sewn to each. We ourselves do not do this. Swabs used to pack off intestine should be wrung out of warm saline solution first.

DRESSINGS

Abdominal section.—If the surface of a carefully closed wound be protected from chafing and injury, it heals admirably exposed to the air, for all dressings have the disadvantage of preventing drying by evaporation, a moist surface being particularly favourable to the growth

of bacteria. We believe that it is a rare occurrence for a wound to become infected after it is once closed, especially if Michel's clips are substituted for penetrating skin-sutures, so quick is the sealing effect of blood serum.

At the Middlesex Hospital we gave up all dressings for clean wounds many years ago. A sterile towel was placed over the wound in the theatre, and maintained there until the patient had recovered consciousness, after which it was removed, the skin, which had been treated with Violet-green, being left in contact with the patient's nightdress. The wounds did just as well, the comfort to the patient was greater, and the expense of dressings was reduced to a minimum.

If we use dressings after abdominal section they are of the simplest kind. The wound is covered with several layers of sterilized white gauze, over which a pad of white sterilized wool may be placed, and, the whole is kept in position by a many-tailed binder or, better, by elastic strapping, which has the advantage that it is immovable and in hot weather, much cooler. When frequent changing of the dressings is required the strapping should be taped (*see* Fig. 604, p. 876).

In the case of the transverse supra-pubic incision described on p. 295, a thick roll of sterile gauze must be applied just above the suture-line and fixed very firmly by bands of strapping. If this is not done there is considerable likelihood of blood effusing into the dead space under the skin, when a large hæmatoma may form and completely nullify the æsthetic object of the incision. *See* p. 299 and Fig. 203.

It is in most instances unnecessary to change the dressing until the day on which the stitches or clips are taken out, but when much oozing has occurred, or when drainage is being employed, this rule must be departed from.

In the first case, a single change of dressing will be required. In the second case the dressing must be changed as often as is necessary, the skin being cleaned up each time this is done.

The difficulty of keeping the lower end of the wound covered, because the dressing tends to ride upwards, is surmounted if elastic strapping is used to fix it. We do not think well of the method of collodionizing a wound, because it prevents the escape of blood and serum, and so creates a possible bacterial nidus.

Dressings stick to certain surfaces, e.g., after colostomy, and are painful to remove. A sheet of stout tinfoil next to the wound obviates this.

Vaginal operations.—For all operations on the vulva and perineum, a T-bandage is required to retain the dressing. This should consist of sterilized gauze covered with a pad of sterilized white wool. It will have to be changed every time the patient passes water or defæcates, and also after each vaginal douche (if such be given) and each time it is well soiled.

After operations on the vagina, cervix, or uterus, if vaginal packing is indicated, it is best done with sterilized gauze soaked in 1-in-500 flavine solution. It should be removed in from 24 to 48 hours, depending on the case. Gauze that has been inserted to check bleeding from the cervix or vagina should certainly be left in for 48 hours. The flavine keeps the packing perfectly sweet. It is not necessary, and in fact is often harmful, to douche the vagina after operations on it or the cervix, except perhaps in the third week, when the catgut is separating and there is an unpleasant smelling discharge.

If intra-uterine packing has to be used to arrest bleeding, flavine gauze is the best. Intra-uterine packing should be withdrawn within 24 hours.

METHODS OF STERILIZATION

Sterilization may be accomplished by means of heat or chemicals.

STERILIZATION BY HEAT

Heat will kill every sort of known bacterium, or spore, if the temperature is high enough and its length of application sufficient. There are three methods of sterilization by heat: (1) dry heat, (2) steam, (3) boiling water.

1. **Dry heat.**—Sterilization by dry heat can be carried out efficiently only by special apparatus. When applied to dressings, towels, or aprons in bulk it takes a long time before the temperature at the centre of the mass is sufficiently raised, and there is some risk of scorching. It has the advantage of not rusting the steel instruments.

2. **Steam.**—This is the best method, especially when applied superheated. Steam sterilizers of various patterns are sold by all instrument makers, and the pattern chosen will depend chiefly upon whether it is intended for hospital or private use.

To be efficient the apparatus must be of the high pressure variety, to ensure the steam being driven into the recesses of the mass of material being sterilized. When very large quantities comprising dressings, coverings, swabs, and towels are required to be sterilized at once, it is also imperative to be able to exhaust the air from the sterilizing chamber before admitting the steam. In the smaller instruments for use in private work this elaboration is not necessary, though it is desirable.

Steam sterilization in hospital work.—In hospitals the main sterilizing plant is usually placed at some distance from the operating theatre or theatres, on account of the heat, and serves the needs not only of the theatres but also of the wards. It goes without saying that the person who is responsible for the working of the plant must be entirely reliable. Although such a sterilizer could be used to sterilize the entire operative

outfit at one exposure, it is more convenient in hospital to reserve its use for the overalls, towels, swabs, and dressings, leaving the instruments, ligatures, gloves, bowls, and trays to be separately sterilized in sterilizers placed in or adjacent to the operating theatre. The efficacy of the sterilization should be tested from time to time.

Steam sterilization in private work.—In most large cities there are firms which supply, at a moderate charge, hermetically sealed tins containing whatever outfit the surgeon desires, reliably sterilized. When such are not available, or the sterilizing plant of his local hospital is not at the surgeon's service, he must possess a small high-pressure sterilizer of his own.

It should contain one long drum large enough to take the entire outfit required for the operation. This drum is supplied with a canvas case into which it is put after being removed from the sterilizer, so that it is conveniently transported to the place where the operation is to be performed.

An outfit such as the following will be sufficient for any operation :

Three overalls and three masks.

The rubber gloves, drainage tube, and catheter.

The instruments and ligatures.

Twelve towels.

A set of swabs (p. 24).

The dressings, a many-tailed binder, and a roll of white gauze.

It is an excellent plan to put up the six components of the outfit just enumerated in separate muslin bags with the name of the contents inscribed thereon in marking ink.

The drum is then packed in the reverse order of this list, and, the apertures in its side being opened, it is placed in the sterilizer. *The reels of silk should have been previously soaked in water and the gloves wetted inside. One hour's sterilization at a pressure of 10 pounds to the square inch will be sufficient.*

If instruments have been thus sterilized, they should not be kept in the drum for more than 12 hours, for those that are not stainless steel will rust.

A smaller emergency drum, containing overalls, masks, towels, swabs, and dressings, should always be kept on hand for those cases in which instant action is required. For such a case the instruments and gloves and silk are to be boiled separately when the surgeon has reached his destination, and during the preparation of the patient for the operation.

The possession of an apparatus such as we have described and of a portable operating table renders a surgeon quite independent of the time and place at which his services may be required, a matter of great

importance to a medical man working in some remote up-country district.

3. **Sterilization by boiling.**—Boiling for half an hour renders any article sterile. The method is very generally used for instruments, silk, thread, silkworm-gut, and bowls and trays, and can be extended to the gloves, swabs, and towels. For overalls and dressings it is not convenient. It has the great advantage that it is always applicable. Ligature material, swabs and towels after boiling should be transferred to 1-in-1,000 biniodide of mercury, from which the two latter should be carefully wrung out before use. Gloves should be placed in sterile water. For the quick and certain sterilization of instruments, five minutes' boiling in a 2 per cent. solution of sodium carbonate is lethal to all types of bacteria, including spores.

Some surgeons do not hold their scalpels, scissors or needles for fear of blunting them, but boiling does not have this effect.

STERILIZATION BY CHEMICALS

It is still not uncommon to hear unthinking persons distinguishing between "aseptic" and "antiseptic surgery" and speaking of the former as though it was something distinct from the use of chemical means of sterilization. Quite apart from the impossibility of comparing asepsis, a state, with antiseptics, an action, it is obvious that surgery is never aseptic which does not in part rely on chemical antiseptics to make it so. The use of chemicals for primary sterilization is limited principally to catgut, the skin or mucous membrane of the operation area, and the hands of the surgeon and his assistants; but they are also usefully employed as a means of maintaining the sterility obtained by heat, and for irrigating infected areas and cavities where such exist after the operation.

Perchloride and biniodide of mercury.—As antiseptics, the great advantages of the salts of mercury are the ease with which they can be carried and their very powerful bactericidal action. On the other hand, they are very poisonous and discolour steel instruments, while they form with albumin an inert compound. Mercury is also decomposed by lead, tin, and copper, so that it cannot be put into vessels made of those substances. Of the two salts, the biniodide is much the better, because it is less inactivated by combination with albumin, is not so poisonous, and does not so readily blacken steel. Both of them, if used over a long period, are irritant to the skin.

Alcohol.—This has the advantage that it can be applied for a long time to the skin without producing irritation. Moreover, as commercial methylated spirit, it is cheap and everywhere obtainable. As ordinarily used for sterilization of the skin of the operation area it only effects surface sterilization.

Iodine.—A 2 per cent. alcoholic solution of iodine is, in general, the commonest method of preparing the surface of the operation area, but to effect even surface sterilization it requires to be applied for some little time. It never effects absolute sterilization, for it does not penetrate deep enough. A perfunctory swab-over is mere camouflage.

Since the skin of some persons is very intolerant of iodine, and a good deal of dermatitis may occasionally result from its application, if it is proposed to use it patients should be asked beforehand if, to their knowledge, it has this effect.

Iodine in the strength of 4 drachms of the tincture to 20 ounces of water is used for vaginal irrigation. Iodine mixed with methylated spirit gives off a vapour very irritating to the eyes.

Peroxide of hydrogen.—Peroxide of hydrogen (10 volumes) is chiefly employed for sloughing and foul surface wounds, especially when the condition is due to infection by anaërobic organisms; it is also excellent for irrigating foul sinuses.

Picric acid.—This is a good antiseptic for the skin. A 3 per cent. solution in 50 per cent. alcohol is employed. It is, as a rule, less irritant than iodine, and is not decolorized and washed off by blood or serum to anything like the same extent. It is applied in the same manner as iodine. In some persons it excites a troublesome pustular inflammation of the skin.

Chlorine.—Chlorine, in the form either of Eusol or of Dakin's solution, was extensively used as an antiseptic in the war of 1914-18, and formed the basis of the Carrel-Dakin method of treating infected wounds. We employ chlorine in the form of Milton's solution as an irrigation for the vagina and for sinuses, the strength used being 2 to 4 teaspoonsfuls to the pint.

Dettol.—Colebrook showed that, even without previous washing of the hands, a halogen derivative of xylenol, called Dettol, will completely rid the skin of hæmolytic streptococci, and will endow the skin for several hours with a protective covering which readily kills the streptococcus pyogenes.

The aniline group.—Several of the aniline derivatives are powerful antiseptics, the best known being brilliant-green, crystal-violet, and flavine. These substances are actively bactericidal, and at the same time are but very slightly injurious to the tissues to which they are applied. Of the three, crystal-violet is the most powerful bactericide and flavine the least, but, on the other hand, flavine is least injurious to the leucocytes, while crystal-violet is the most injurious, brilliant-green taking up an intermediate position in both respects.

The sulphonamide group.—Besides the oral use of these modern drugs to combat local or general coccal infection, they can be applied to wounds as a dusting powder, either as a prophylactic, or as a deterrent

where infection already exists. Of their efficacy in this rôle there is as yet no absolute proof, but in general opinion the results are encouraging. It is now usual to combine them with penicillin, sufficient sterile sulphanilamide or sulphathiazole powder being mixed with penicillin powder (preferably calcium salt) to produce a final concentration of 2,000-3,000 penicillin units per gram. It is blown by an insufflator on to the surface of the wound, which should be relatively dry, as blood or exudate rapidly washes it away. This is generally repeated every 24 hours. Sloughs and necrotic tissue should be removed before insufflation as organisms harboured therein are beyond the reach of the powder.

Antibiotics.—It is beyond the scope of this book to minutely discuss penicillin and the other antibiotics, latest and the most powerful weapons against infection that we now possess. Penicillin is generally given by intramuscular injection (with 1 per cent. procaine added) every three hours. The single effective dose is 15,000 units which produces a bacteriostatic concentration in the blood which lasts for three hours. In severe infections much larger doses can be given with perfect safety. It can also be given by intravenous drip, 100,000 units in twenty-four hours, and can be applied locally as a dusting powder (*see above*), a solution in sterile saline or as a cream. Since penicillin fails in the case of infection by Gram-negative organisms, where such infection is known to be present Streptomycin or Aureomycin should be employed.

General remarks on the use of antiseptics.—The uses of antiseptic substances may be thus summed up :

The skin of the operation area.—The problem how to effect absolute sterilization of the skin of the operation area is one of the utmost importance in surgery, but it is difficult of solution because all the usually employed antiseptics are more or less strongly irritant, so that their prolonged application for the purpose of seeking out organisms lying beneath the superficial layer of epithelial squames, or sequestered in the sweat and sebaceous glands and the hair-follicles, is impossible.

The action of such antiseptics is thus limited to the surface of the skin only, and those organisms which lie deeper escape destruction. Moreover, the antiseptics are rendered inactive by admixture with albuminous substances, so that the blood from the wound, on coming in contact with the prepared skin, immediately neutralizes the small amount of the antiseptic. For example, every trace of the colour of iodine disappears from the neighbourhood of the wound long before the operation is finished.

If the iodine had already sterilized the skin throughout its whole thickness, this would not matter, but as a fact its sterilizing action is limited to the surface, with the result that the rubbing of the soddened skin surrounding the wound, which is more or less inevitable as the operation proceeds, first removes the superficial layer which is sterile and then begins to detach epithelial scales which the antiseptic has

never reached. The conveyance of unsterilized squames into the wound is a potential cause of sepsis. A recent investigation by Victor Bonney and Sandeman Allen showed that of cultures taken from the unprepared abdominal skin, *S. aureus* (generally hæmolytic) was found in 90 per cent. of the cases and the frequency, on the skin, of so dangerous an organism should give all surgeons to think furiously. It is in order to obviate such infection that rubber sheeting is attached to the edges of the parietal wound (p. 279).

Victor Bonney and C. H. Browning* in 1915 introduced the use of a strong solution of crystal-violet and brilliant green, called by them "Violet-green,"† to produce not only a sterile but an actively antiseptic condition of the skin. These substances are both extremely potent antiseptics, but at the same time are devoid of irritating effect on the skin when applied in a much higher concentration and over a much longer period of time than any other of the antiseptics. We employ this as a routine as follows :

The solution contains 1 per cent. of a mixture of equal parts of crystal-violet‡ and brilliant green|| dissolved in 50 per cent. of rectified spirit and 50 per cent. of water. (The powder is dissolved in the undiluted spirit first of all, and the water then added.) Not less than 6 hours before an abdominal operation the solution is painted over the skin of the operation area ; a compress of lint soaked in the same and covered by a sheet of waterproof batiste is then applied and kept in position by a hinder or bandage. This compress is removed on the operating table. The result is that the skin is stained an intense violet-black ; the staining remains unchanged throughout the operation and, indeed, for a week or two afterwards.** This prolonged application of the antiseptic does not produce any irritation of the skin. For vaginal operations the same technique is employed except that, owing to the great sensitiveness of the vulval and vaginal mucous membranes, those portions of the operation area are not painted until the patient is on the operating table, the compress being applied to the perivulval and perianal skin only.

The authors named carried out a number of experiments which conclusively proved that Violet-green as a sterilizer of the skin was far more efficient than any other antiseptic known at that time, and this conclusion has since been corroborated by a number of other workers. We employed this method of preparing the skin of the operation area, our both in abdominal and vaginal work, for very many years, and clinical results have accorded with theoretical expectation.

* "Sterilization of the Skin and other Surfaces by a Mixture of Crystal-violet and Brilliant Green," *Brit. Med. Journ.*, May 15, 1915.

† Sometimes irreverently known as "Bonney's Blue" !

‡ The substance employed should be hexa- or penta-methyl violet, or a mixture of these.

|| Specified as brilliant-green sulphate, zinc-free.

** The colour is best removed with methylated spirit or a very weak solution of hydrochloric acid.

It has been urged against Violet-green that it deeply and for a long time stains linen and other substances with which it comes in contact, but for our part we consider that the permanence of the dye is one of its greatest advantages: "seeing is believing." Those who think otherwise we would refer to a recent publication wherein is described a new antiseptic solution* similar to Violet-green except that its two dyes are replaced by 1 per cent. of Colourless Flavine (5 Amino-acridine). Like Violet-green this solution is absolutely non-irritant whilst it merely stains the skin a faint lemon colour. It is used in the same way and is a potent bactericide.

When neither Violet-green nor flavine is available, we think Dettol is to be chosen.

Iodine has the advantage that it is easily obtainable, does not permanently stain the bed-clothes, and dries quickly, but the sterilization is very superficial, and at the first contact with blood or serum the antiseptic is decolorized and washed off, while prolonged application in order to reach the deeper epidermal layers and the bottom of the hair- and sebaceous-follicles is impossible owing to its irritant action.

It has been argued that simple cleanliness obtained by the liberal use of soap and water will by itself yield excellent results, and this is perfectly true of relatively "clean" surfaces, such as the abdominal skin, particularly if the skin be covered by sheet rubber or sterile towels in the manner described on p. 279. For skin areas always more or less heavily infected, like the perianal and perivulval regions, it is, however, quite insufficient, and, moreover, wheresoever the operation area be situated, theory demands that the skin covering it should be sterilized as completely as possible.

Sterilization of the vagina.—Sterilization of the surface of the vagina is very difficult in any circumstances, and is impossible in circumstances in which a septic discharge from the cervix or uterus is continually fouling it. Violet-green is by far the best antiseptic to use for the purpose. For vaginal operations and total hysterectomy it suffices to swab thoroughly the vulva and vagina on the operating table. In Wertbeim's operation, and abdomino-vaginal excision of the rectum (see pp. 374 and 750), the vaginal packing should be soaked in the antiseptic *diluted with an equal quantity of water*, so that by the time the vagina is cut into its surface is sterile. Incidentally it may be pointed out that the dark violet coloration of the vagina which it causes is a great help to the operator in defining the position and limits of the canal when he opens it from above.

If Dettol is used care must be taken that none runs down into the fold between the buttocks, or the skin may be badly excoriated.

Sterilization of the hands.—For the preparation of the surgeon's and

* "Sterilization of the Skin by Colourless Flavine," Victor Bonney and Sandeman Allen, B M J. Aug. 12, 1944, vol. ii, p. 210.

assistants' hands, we are not in favour of immersion of the naked hands in strong antiseptics, for although certain individuals seem to be able to subject their hands to the most severe preparation day after day without ill-effects on the skin, yet in most individuals, sooner or later, a dry, rough, and cracked condition ensues, which is most undesirable. We advise simple washing with soap and plenty of running water, leaving immersion in a strong antiseptic solution until after the gloves are put on. We have often noticed that some of those who in the operating theatre mercilessly subject their hands to innumerable washings and immersions in strongly irritant antiseptic solutions, out of the theatre are singularly careless about them, and will, without the least hesitation, thrust their fingers into a patient's mouth, or palpate the neighbourhood of a pus-discharging sinus.

A man who thus deliberately fouls his hands out of the operating theatre must certainly use the strongest antiseptics possible in the theatre, but the practice is a very bad one, and personally we pray that we may never fall into the hands of such a surgeon.

Gloves must be worn habitually by all persons concerned first-hand in surgical operations, not in the theatre only, but at all other times when their professional work calls for manipulations likely to infect their hands. Given hands never exposed to contamination with virulent organisms, washing alone is sufficient preparation. For those whose skin will stand it, swabbing with methylated spirit after washing may be employed to dry the hands, but a sterile towel is better.

It has been conclusively proved that rubber gloves can be sterilized on the hand, and one of us (C. B.) for many years carried out this practice, using the same pair of gloves for a series of operations, re-sterilizing them for each operation by thorough washing and immersion in 1-in-500 hinioidide of mercury solution. This practice is very economical in such an institution as a teaching hospital where a large number of gloves may be in use during the operations. It has the drawback that to ensure sterility of the gloves it is necessary to immerse the arm above the glove in the antiseptic solution, and the skin of some persons will not tolerate this. During the course of an operation the surgeon should frequently wash his gloved hands in a strong antiseptic solution.

Wounds.—In gynæcological surgery the surgeon is usually dealing with a clean wound from the first, and the question of the application to it of antiseptics does not, as a rule, arise. There are, however, certain cases in which it is certain or probable that during the operation the abdominal wound has become infected, as in acute pyosalpinx, appendicitis, or foul carcinoma of the cervix, and so forth, and in such he should endeavour to sterilize the infected area before suture. For this purpose insufflation with penicillin and sulphathiazole powder (*see p. 30*) is the most effective, or if penicillin is not available, sulphanilamide or

sulphathiazole powder (previously sterilized) can be used. Failing these also, Violet-green or the colourless flavine solution already described can be applied, since they do not materially injure the tissues or retard healing. The use of penicillin allows a tube to be dispensed with in many cases, which, before Flemming's and Florey's work, would certainly have required drainage.

Sterilization of the Air.—Aerial transmission of infection was insisted on by Lister from the beginning of his great work, but those who followed after him disputed or depreciated the idea so that it fell into abeyance. Recently, however, experimental research has established the truth of the great pioneer's conception, and the carbolic spray, which for many years was subject to derision, is now seen to have been a logical and praiseworthy attempt to cope with a very real danger.

Dust is the vehicle of transmission; Leonard Colebrook has shown that culture plates exposed in a room which has housed a case of streptococcal infection remain uninfected so long as the air is perfectly still, but as soon as a dust is raised the organism appears on the medium, even though for some considerable time beforehand the room has been kept empty and undisturbed. The most striking thing brought out by Colebrook and his co-workers is the effect of removing clothes and blankets and changing dressings. These proceedings immediately liberate a cloud of bacteria whose presence is duly registered on culture plates so arranged that different segments of the surface of the medium are successively exposed. An important contributor to dust is "droplet infection," for it has been demonstrated by Wells that, besides the gross drops of fluid from the mouth or nose which spray out and fall to the ground, there are many smaller ones, which evaporate before reaching it. These leave a minute droplet-nucleus of dried mucus containing bacteria, and this remains suspended in the air.

Dust infection can be largely prevented by applying medicinal liquid paraffin to night clothes, blankets and dressings, and by removing them, when they have to be removed, *in the ward and not in the operating theatre*. The patient should come into the theatre naked except for a sterilized paraffin-treated blanket and the theatre floor should be daily wiped over with paraffin.

Colebrook also studied the effect of ventilation on dust infection and found that a system whereby air is forced into the theatre at a slight positive pressure, is much superior to one which, by sucking out the air, creates a slight negative pressure. The air pushed in should enter at the top of the theatre, and be slightly warmed to prevent it descending too fast. Filtration of the in-driven air is very desirable and it should be gathered from as high a level as possible, for there is the least dust found.*

Droplet infection is countered by the wearing of masks. Much has

* Colebrook and Bourdillon, *Lancet*, pp. 561 and 601, 1946.

been accomplished in the last few years and it cannot be doubted that human ingenuity and persistence are such that the problem will presently be entirely solved. In the meantime the surgeon should constantly bear in mind the importance of avoiding dust.

Vaginal douching.—For routine vaginal douching many solutions are available. A 1-in-1,000 watery solution of *colourless flavine* is probably the best of all antiseptic douches, for it has the advantage of not staining bed-clothes and other linen articles. Chlorine, in the form of Milton solution, one drachm to a pint, is excellent. It should be used only slightly warmed, otherwise the chlorine is driven off. Dettol, one drachm to the pint, is good and biniodide of mercury 1 in 4,000, and iodine 4 drachms of the tincture to a pint, are often used, but mercury sometimes causes irritation, and mercurial douches in a few persons of peculiar disposition give rise to symptoms of mercurialism. For foul discharges, or when a sloughing condition is present, peroxide of hydrogen is very satisfactory. For douching after colpo-perineoplasty a non-toxic antiseptic should be used, for owing to the narrowing of the vaginal orifice there is a tendency for some of the douche solution to be retained in the vagina.

SUTURES

We consider that, for suturing in most situations, the best needle to use is Reverdin's. If Bonney's needles are being used they should—unless of the large size—be grasped with a Spencer Wells pressure forceps or needle-holder and not with the fingers. The hand obstructs the view, handling the needle is likely to prick the glove, and there are certain situations in which the hand cannot be used. For similar reasons such needles should always be withdrawn either with the dissecting forceps in the left hand or the pressure forceps in the right. We make an exception when retaining sutures in the abdominal wound are being used. In these circumstances the 5-inch Bonney's needle held in the fingers will be found most useful. For fine work, like intestinal suture, Souttar's eyeless needles should be used.

Interrupted sutures. Simple (Fig. 33, 1).—The advantage of the interrupted suture is that if it becomes septic or gives way the remaining sutures in its neighbourhood are not necessarily affected. It should therefore always be chosen for the skin of a wound which pre-existent infection makes likely to suppurate.

The simple interrupted suture is also used for such purposes as closing the fascia in an abdominal wound, for bringing together the edges of the levatores ani in colpo-perineoplasty and the uterine wall in myomectomy.

Lembert's (Fig. 33, 1).—This suture inverts the edges of the wound and effects a larger area of approximation than does a simple interrupted suture.

Mattress (Fig. 33, 1).—In cases in which a suture is used not only to approximate the parts but also to secure hæmostasis, a mattress-suture will be found the most useful. It is also the best when great tension exists between the parts it is desired to bring together. Its drawback is that, if many are used, the blood supply distal to the sutures is interfered with, so it should be employed as sparingly as possible.

Cross suture (Fig. 33, 2).—This suture is very useful in approximating the wedge-like flaps of the stump in subtotal hysterectomy, or in closing the mouth of a small aperture, such as the external cervical os as a preliminary to total hysterectomy.

Figure-of-8 (Fig. 33, 2).—This suture is very useful for tying a piece of silk to be used as a tractor. The suture is passed like a mattress-suture and the looped end tied to the free ends.

Continuous sutures.—A continuous suture secures a more perfect approximation and hæmostasis, minimizes the number of knots each of which, from the greater time it takes to absorb, is a possible focus of stitch suppuration, and is more rapidly performed than a series of interrupted sutures. It has the disadvantage that if one portion slips the whole goes, and if one portion becomes septic the whole is affected. Further, it leaves no room for drainage between the suture-holes, so that if there is any oozing below it the blood is pent up. A simple continuous suture to an extent puckers (shortens) the wound and, we think, tends to promote keloid on this account, though not sufficiently so as to become a marked disadvantage.

Simple (Fig. 33, 3).—This is the most generally useful continuous suture, and we use it as a routine in closing the peritoneum and fascia of the abdominal wound, reforming the vagina in perineoplasty and for skin suture if Michel's clips are not employed.

Blanket (Fig. 33, 4).—This is a pretty suture, gives a very good approximation, and has the advantage of securing each stitch of the suture before the next one is passed. It is chiefly used for skin surfaces.

Lembert's (Fig. 33, 5).—A continuous Lembert's suture is indicated when it is necessary to get a water-tight, or gas-tight union, as, for instance, in suturing the bladder or in intestinal anastomosis. It gives also a very neat result in closing the peritoneal flaps in hysterectomy or in any similar condition.

Cushing's suture (Fig. 33, 6).—This modification of the continuous Lembert suture is useful in certain circumstances, such as attaching the anterior peritoneal flap to the back of the cervical stump in subtotal hysterectomy.

Connell's suture (Fig. 34, 9).—This is essentially the same as Cushing's suture except that the needle is made to penetrate the whole thickness

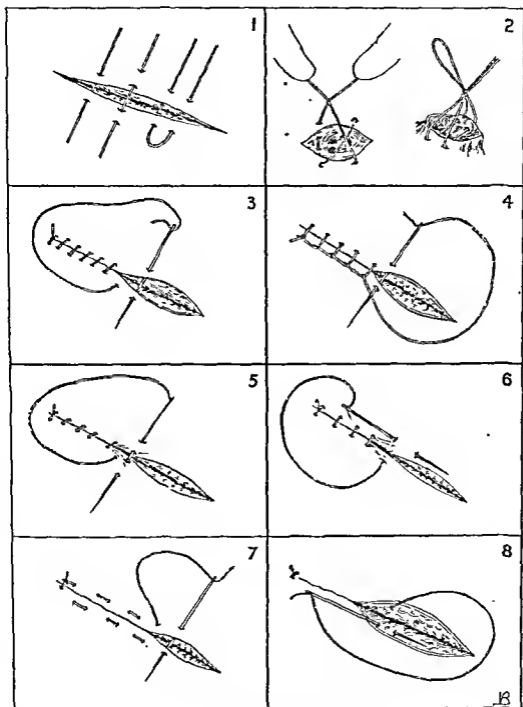


Fig. 33.—Methods of suturing (see text).

of the tissue. As applied to suture of the bowel (its most frequent application), it results in a series of loops of the suture material showing in the lumen of the intestine. When drawn tight it *inverts* the raw edges into the lumen. It is employed for the superior half of the inner circular suture in end-to-end anastomosis, side-to-side anastomosis, and gastro-enterostomy.

The glover's stitch (Fig. 33, 7).—This method produces marked eversion of the wound-edges and is indicated when hæmostasis is important. The everted edges of the wound can be subsequently brought together by an ordinary continuous suture.

Puckering (Fig. 34, 10).—This suture is used for puckering the ovarian ligament in ovarian suspension, and the round ligament when shortening it, and for closing the gap of the broad ligament and approximating the stump of the round ligament to the stump of the uterus in hysterectomy.

Purse-string (Fig. 34, 11).—Useful for closing gaps, as, for instance, holes in the broad ligament, and for burying pedicles, e.g. the ovarian stump after hysterectomy.

Inverting (Fig. 34, 12).—Used in closing over the stump of the appendix and for obliterating small holes in the bladder.

Subcuticular suture (Fig. 33, 8).—This suture is an elegant method of closing a skin incision after the deeper parts of the wound have been brought together. Its great advantage is that sutures needing removal are not left. It is specially indicated for the central abdominal incision in abdomino-vaginal or abdomino-perineal excision of the rectum or any other condition in which a lateral colostomy would jeopardize the healing of a middle line incision, because it does away with sutures penetrating the skin through which infection may reach the deeper parts. It is also the suture to employ when operating on persons of unsound mind because the wound can then be covered with strapping taken right round the body, making it impossible for the patient to do damage to it.

KNOTS AND METHODS OF TYING THEM

Facility in tying knots is an important part of surgical technique and all young surgeons should do their utmost to excel in it. It does not suffice to be able to tie quickly and surely one variety of knot only, because, of the large number that may be employed, each one has some special advantage in relation to the position of the parts where the knot is to be tied and the position of the surgeon's hands at the moment. He who only uses one variety has frequently to shift his hands into the position required for the tying, whereas he who has a variety in his repertory proceeds to tie at once, no matter how the threads are presented to him.

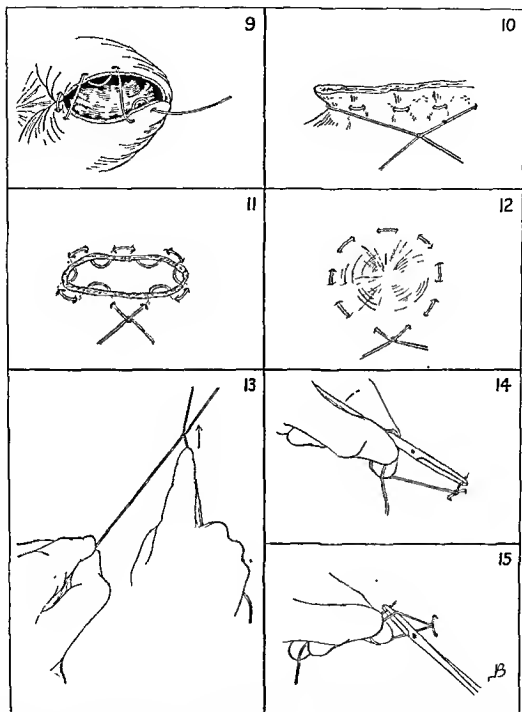


Fig. 34.—Methods of suturing (continued) and some methods of tying knots (see text).

The ends of a knot of silk, thread, or silkworm-gut should be cut short, because these materials are with difficulty or not at all absorbable, and it is desirable to minimize as much as possible the quantity of them buried in the tissues. But this is not the case with a catgut knot, the cut ends of which should never be less than one third of an inch long unless the knot immediately underlies the skin or some other surface. The reason for dealing thus differently with catgut is the liability of catgut knots to slipping. If this happens in but a slight degree, when the ends have been cut close, the knot will give way, whereas with a half-inch end much more slip may occur without such an untoward happening. Moreover, as the suture material is going to absorb, the amount buried, within reasonable limits, does not matter.

The surgeon whose assistant, proud of the steadiness of his eye and hand but ignorant of this important point, dexterously shaves off the ends right down to the catgut knot, will some day undergo the mortification of having to resuture a hurt wound.

The granny.—This of all the knots, is the simplest and quickest, the two hitches that make up the knot being identical. It has the advantage that the first hitch is easily held tight while the second is being made and that should the first hitch slip, the second tightens it again. On the other hand, the knot is likely to loosen under centrifugal force and hence, if used to secure a thick pedicle or important vessel, a third hitch should be applied, which makes it quite secure. The method of tying it is shown in Fig. 35, 1, 2, 3. A reverse granny is shown in Fig. 35, 6. This hitch is in the reverse direction to that of the ordinary granny. A combination of the two does not, however, make a true reef knot.

The reef knot.—This knot consists of two hitches, one tied with one end of the ligature and one tied with the other end. It can be effected by tying one half of a granny knot over the left forefinger and then tying the second half over the right forefinger in the same way. Another good way of tying a reef knot is shown in Fig. 35, 4, 5, the second hitch being tied over the right hand instead of the left. The advantage of a reef knot is that the more it is strained the tighter it becomes; on the other hand, if the first hitch slips, the second will not tighten it. The safest knot of all is a combination of two "granny hitches" with one "reef hitch," for the first two ensure against slipping while the third locks them.

The surgeon's knot.—This is another method of guarding against slipping. The first hitch is tied as shown in Fig. 35, 1, but the right-hand end of the thread is carried twice round the left-hand end. It puts a good deal of strain on the ligature when tying it. This knot is a necessity when using substitute (nylon) gut.

The single-handed knot.—Every surgeon should be able to tie this very useful knot, and it is a necessity if the wrist-reel shown in

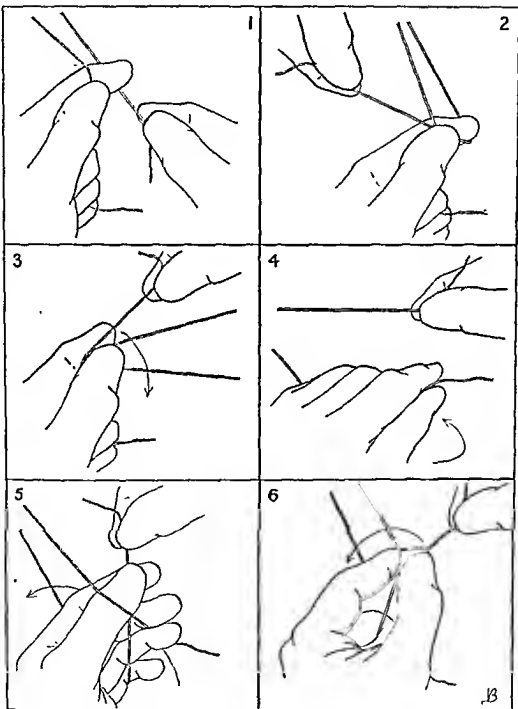


Fig. 35.—Methods of tying knots (see text).

Fig. 25 is to be used. There are two methods of tying it, the hitch produced by one method being the reverse of that produced by the other. The two may be combined but, as with the combination of a granny and a reverse granny hitch, a true reef knot is not effected (Fig. 36, 7, 8, 9, 10).

The forceps knot.—This is a very elegant method of tying knots because the hands do not obscure the view. As with the single-handed knot, of which it is really a variety, there are two methods of performing it, the hitches produced by the one being the reverse of those produced by the other (Fig. 36, 11, 12).

Tying with short ends.—There are two ways of doing this, as shown in Fig. 34, 14, 15. In the first, the shorter end is lengthened by attaching a Spencer Wells forceps to it and the longer end is tied round the forceps and then slipped down. In the second the shorter end is tied round the longer end by means of the forceps. If both ends are very short, the methods can be combined.

Tying in deep holes.—In gynecological operations more than in any other branch of surgery, it is often necessary to tie knots in deep holes. The following is the method. Having made the hitch by whatsoever method he chooses, the surgeon shortens his grip on the thread in one hand and pushes the hitch downwards with the point of the forefinger of the same hand, tension being made meanwhile on the thread held in his other hand (Fig. 34, 13).

LIGATURES

Ligatures may be divided into two kinds: (1) occluding and (2) suboccluding.*

1. An **occluding ligature** is one that entirely cuts off the blood-supply to the part distal to the ligature. The different methods shown in Fig. 37 (*a, b, c, f, g, h*) are examples of this variety. The tissue distal to a ligature of this kind is in a condition practically identical with that of a white infarction, and undergoes anæmic necrosis. With an occluding ligature, hæmorrhage is not only immediately perfect, but, supposing the ligature holds, permanent, and the likelihood of forming adhesions is reduced to a minimum, because the tissues distal to the ligature, being dead, are incapable of taking any active part in the making of such an adhesion. The condition is comparable to that which obtains when a portion of foreign tissue is experimentally implanted in the peritoneal cavity of an animal: it is only after the lapse of many weeks that thin filamentous adhesions, derived from the vascularization of the coagulable lymph thrown out by the peritoneum, form round the foreign substance. Moreover, the presence of the ligature forms an impassable barrier between the area of anæmic necrosis distal to the ligature and the blood-vessels and lymphatics proximal to it, so that toxic absorption by this route is impossible.

* Victor Bonney. "Occluding and Suboccluding Ligatures," *Lancet*, August 13, 1910

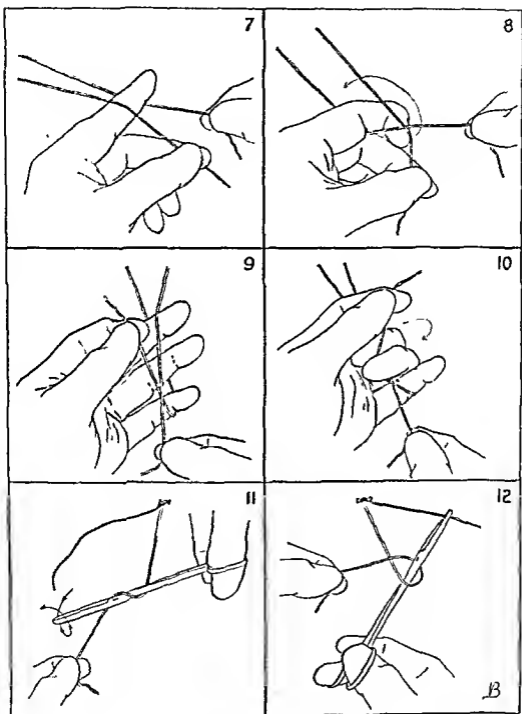


Fig. 36.—Methods of tying knots (continued) (see text).

Finally, the area of coagulation necrosis produced by an occluding ligature, like the area of a white infarction, appears to possess a certain immunity against bacterial infection as compared with the area of a red infarct—a point to which we shall immediately refer.

2. **Suboccluding ligatures** are those in which the main blood-supply to the portion distal to the ligature is cut off, but a track of capillary anastomosis remains (see Fig. 37, *c, d*). Of this the mattress-ligature is an example, and the tissues distal to it are in circumstances analogous to those of a red infarction. It not infrequently happens that, after a suboccluding ligature has been applied, the collateral capillary circulation develops to such an extent that the tissues distal to the ligature become engorged with blood and oozing presently starts from the cut surface, so that a hæmatoma is formed round it in the peritoneal cavity, which may be the starting-point of a good deal of local peritonitis with much constitutional disturbance, or may even be large enough to produce symptoms of post-operative hæmorrhage. It is owing to this cause that certain patients do not make the rapid convalescence which might be expected. It is further a fact that tissues in the engorged and partially devitalized state which obtains in a red infarct are peculiarly liable to bacterial infection. As an example of this, the case of the omentum may be cited, partial strangulation of a portion of which is soon followed by very acute symptoms, whereas the common methods of ligaturing omentum leave, distally to these ligatures, equally large or larger areas of it in a condition of anæmic necrosis without producing the slightest ill-effects. The different effects produced by the partial strangulation of a pile caught by the anal sphincter, or a small portion of intestinal wall constricted in a hernial sac (Richter's hernia), or the spontaneous torsion of the pedicle of an ovary, and the complete strangulation of the same parts that surgical ligature effects are other examples. Again, a reference to general pathology will show that whereas white infarction frequently occurs without any symptoms (e.g. the spleen and kidney in endocarditis), red infarction is always marked by acute pain and inflammatory symptoms. Thus the tissue distal to a suboccluding ligature is much more likely to become the seat of an acute bacterial infection than that distal to an occluding ligature, and since connexion between the area distal to the suboccluding ligature and the body tissues at large on the other side of it still exists, a route for toxic absorption is open. Moreover, since the cells of the tissue distal to a suboccluding ligature are not dead but merely damaged, adhesion much more readily occurs, especially if the surface is surrounded by blood-clot due to oozing whereas the tissue distal to an occluding ligature, being dead, cannot partake in the formation of an adhesion. Activity on both sides is needed to make a strong adhesion.

It is, therefore, obviously better, whenever possible, entirely to occlude the blood from the area distal to a ligature. It is for this reason

that the practice of what appears an excessively massive and clumsy method of ligation of the tissue leads to results which, on first consideration, would seem to be unobtainable.

METHODS OF TYING PEDICLES

There are 9 different ways by which pedicles may be tied (Fig. 37). Which special method is followed depends partly upon the idiosyncrasies of the operator, partly on the particular pedicle to be tied, and partly upon the time at the disposal of the operator.

Method *a* consists in surrounding the pedicle with a length of ligature material and tying it with a suitable knot. It is the simplest and quickest, but at the same time it is the most dangerous, because

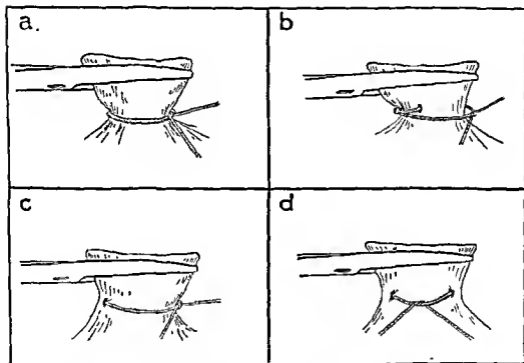


Fig. 37.—Methods of ligaturing pedicles (see text).

with it the pedicle is most likely to slip. If the pedicle, therefore, contains any important vessels, or if it is much on the stretch, this method should not be followed. It serves very well for the cut ends of the round ligaments, for pieces of omentum, and for slight adhesions.

In method *b* the pedicle is transfixed through its centre, and, one of the halves being tied, the ligature is brought back so as to surround both halves and tied again.

Method *c* is a quicker method than method *b*, and safer than method *a*. Its advantage over *a* is that it does not slip, and its disadvantage when compared with method *b* is that the blood-supply to the portion of the pedicle distal to the ligature is not entirely cut off and an anastomotic

circulation may, in certain circumstances, be re-established to such an extent as to cause dangerous oozing, while occasionally, even, an artery of some size may be left unoccluded in the small portion of tissue outside the grip of the ligature. This may, however, be obviated by bringing back the ligature ends after tying the knot so as to include the whole mass, and then tying again in a manner similar to method *b*.

In method *d* the tissue to be ligatured is transfixcd in alternate directions at either edge and then tied—the mattress-ligature. It effects a grip of the enclosed tissue which, if the knot be firmly tied, is almost incapable of slipping. On the other hand it has the same

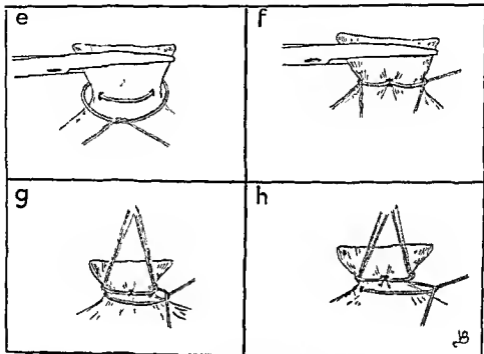


Fig. 37 (continued).—Methods of ligaturing pedicles (see text).

disadvantages as those of method *c* when applied to a pedicle containing large vessels. It is employed chiefly for bunching up and closing raw and oozing surfaces.

Method *e* obviates the disadvantages attaching to method *d*. After the mattress-ligature has been tied with a double knot, the free ends of the ligature are made to encircle the whole pedicle and are again tied.

In method *f* the pedicle is transfixcd by a double piece of silk, the loop of which is cut, making two separate ligatures, and each half of the pedicle is then tied separately. It has the disadvantage of leaving a space between the two halves of the ligature, from which hæmorrhage may occur if, in passing the ligature, a vessel has been pricked.

Method *g* is an elaboration of method *e*, a separate ligature being

passed round the whole pedicle after the two halves have been tied. It is a better method than method *c*, because it secures any small vessel which may have escaped the transfixion-ligature at the point of transfixion, while the surround ligature alone is capable of controlling the pedicle in the event of either of the other two ligatures slipping. Its disadvantage is the amount of ligature material that is of necessity buried in the tissues.

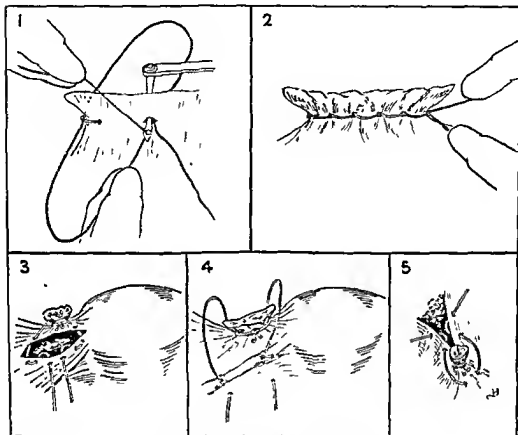


Fig. 38.—The chain ligature (1 and 2). Methods of burying stumps (3, 4 and 5). (See text.)

Method *h* is the most perfect of all from the point of view of security, and takes the longest time. It differs from method *f* inasmuch as the surround ligature is made to transfix a small piece of tissue externally to the pedicle, which prevents this structure from slipping.

When a pedicle is too broad to be secured by any of the preceding methods, the chain-ligature (Fig. 38, 1, 2) must be employed. This is a common method of ligaturing omentum.

LIGATURE HÆMATOMA

By a ligature hæmatoma we mean an effusion of blood due to a vein being pricked by the needle as a transfixion-ligature is being passed.

The most likely occasion for this complication to take place is

when the ovarian or uterine arteries are being ligatured, when, if the ovarian or uterine vein is pricked or perforated, blood will escape under the peritoneum into the cellular tissue at the brim of the pelvis or in the broad ligament. The accident, which is at once recognized by the appearance of a dark-blue turgid swelling can, on most occasions, be avoided if care is taken. Thus, when ligaturing the ovarian artery, the upper part of the broad ligament should always be pulled up and the needle then passed through an avascular spot. Also, when ligaturing the uterine artery in hysterectomy, after passing the needle through the cervical tissue, the vessels should be tied under the forceps grasping them, instead of transfixing the broad ligament with a mattress-suture, since it is nearly always when doing this that the vein is injured. If such an accident does occur, the tissue over the effused blood should be at once grasped with forceps and another ligature passed. It is sometimes rather difficult to tell, after the second ligature has been tied, whether one has successfully arrested the hæmorrhage, because the blood which has already escaped will still be *in situ*; care should therefore be taken during the remainder of the operation to examine, at intervals, the retroperitoneal hæmatoma, to ascertain whether it is increasing in size.

If a large vein is badly injured, the escape of blood will be very rapid and marked, so that the blue swelling quickly spreads along under the peritoneum. If this occurs, a deliberate search must at once be made for the vessel by separating the layers of peritoneum and dissecting, if necessary, the cellular tissue till the bleeding-point is discovered. This, at times, may be a difficult and tedious matter, as the effused blood ploughs up the tissues in the neighbourhood, altering both their relation and, by their staining, their appearance. We have seen effused blood from a large ovarian vein infiltrate the tissues up to the perinephric fat before the hæmorrhage could be arrested.

ON THE BURYING OF STUMPS

A stump projecting into the peritoneal cavity should be buried under the peritoneum, if this be possible, to prevent adhesion to it of gut or omentum.

The method by which burying is effected will depend on the situation of the pedicle. The ovarian stumps in hysterectomy should be covered over in the way presently to be described (*see p. 311*).

The stump of the pedicle of an ovarian cyst may in some cases be tucked under the broad ligament, as shown in Fig. 38, 5, or it may be inserted between its layers through a hole made for it, as shown in Fig. 38, 3. But when the stump is broad this is impossible. For such cases, and for the broad stumps left after removal of the ovary and Fallopian tube for inflammatory disease, the peritoneum on the front of the broad ligament may, together with the round ligament, be overfolded backwards and stitched to the back of the broad

ligament and the back of the uterus below the situation of the pedicles (Fig. 38, 4).

In cases in which the cyst, or appendage, is very adherent as, for instance, in many cases of pyosalpinx, the peritoneum is so destroyed and the tissues are so rigid that it is impossible to cover the pedicles. Adhesions in such cases, however, cannot be avoided, even if it be possible to bury the stumps, and in this connexion it may be pointed out that intestinal obstruction much more often arises from a small isolated adhesion than from multiple and extensive adhesions. This is because a small adhesion leaves the coil mobile except at one point, so that it easily becomes kinked there, or a volvulus may be formed by the whole coil rotating round the point of adhesion.

It must, however, be noted that when the burying of a stump is difficult on account of a deficiency of loose peritoneum, so that many sutures, all liable to cut out, have to be used, the end result may be more conducive to adhesion than the uncovered stump. In such cases burying should be dispensed with, care being taken that the stump is secured by an occluding ligature (*see p. 42*).

Stumps can be largely avoided by abandoning mass ligatures, securing the vessels separately and suturing the peritoneum over the raw surface. This gives a very neat result, but care must be taken lest one of the vessels, having retracted under the peritoneum, escape ligature.

DRAINAGE

When to drain.—The occasions on which drainage is to be employed, after abdominal section for pelvic disease, is a matter for nice discrimination. For, on the one hand, failure to take this precaution when called for may lead to death, severe illness, or a second operation for retained pus; on the other hand, unnecessary drainage, while probably never a cause of severe infection under modern conditions, may induce discharge when none would have otherwise resulted, prolongs convalescence, and tends to leave a weak spot in the scar.

The mere presence of pus in the pelvis is not a sufficient indication for drainage, and this is particularly true of cases of pyosalpinx, for in a large number of such cases investigated by us at the Middlesex Hospital, in which the pus had been sequestered for a considerable time, organisms could not be isolated; and the same result has been recorded by many other workers. Such sterile pus is often extremely evil-smelling, so that faecal is no indication for drainage.

On the other hand, pus primarily formed in the peritoneum, such as occurs round necrotic tumours, the inflamed appendix, or a suppurating hæmatocele, probably contains active streptococci or colon bacilli, and the same holds good for the contents of inflamed ovarian cysts, suppurating solid tumours, or a recent pyosalpinx. In such conditions the operation area must certainly be drained.

As a general rule, it may be laid down that when the peritoneum covering the pelvic organs, and the coils of gut in relation with them, shows signs of acute or subacute peritonitis, with definite reddening and injection, drainage should be employed whether pus be present or not; but when, even in the presence of a large collection of pus, the peritoneum is pale, uninjected and inert in appearance, drainage is not as a rule necessary.

There are certain cases in which a drain is advantageously inserted for a short time, i.e. those in which future suppuration or extravasation, though not likely, is at least possible.

Thus, if there be some doubts as to the soundness of the suture-line after resection of intestine, a small drain may be inserted down to the involved coil and removed at the end of 48 hours. Again, in certain cases of hæmatocele, when, by reason of the pre-operative presence of fever, infection of the pelvic peritoneum appears likely to have occurred, it is a wise precaution to insert a small drain for a couple of days. Drains left in for this period form a track along which the products of suppuration or of extravasation, taking place later on, may find a way.

Abdominal or vaginal drainage.—It would at first sight appear that a vaginal drain should have certain advantages over an abdominal one, partly because it does not necessitate any weakening of the abdominal wound, and partly because of its dependent position. Of these points the first is true, but in regard to the second there can be no doubt that vaginal drainage is less efficient than abdominal, although the current in the latter case is against the force of gravity; for when both abdominal and vaginal drainage are simultaneously employed, the discharge is much freer, and continues much longer, from the upper than from the lower opening.

The reasons for this are not entirely obvious, but it may be remarked that an opening into the top of the vagina is placed, not at the bottom of the pouch of Douglas but well up on its anterior wall, so that it does not really directly drain the lowest portion of the pelvic cavity; and further, that there is a great tendency for this opening to close prematurely, either by rapid adhesion to a prolapsed coil of pelvic colon, or, as frequently happens after total hysterectomy, by the bladder falling back and adhering to the rectum.

A vaginal drain is also not easy to keep in position, is impossible to maintain clean, troublesome to remove, and difficult to re-insert. Moreover, the liability of the area drained to become secondarily infected *via* the drainage tube is much greater than when the tube is brought out through the abdominal wall. For these reasons we consider that for drainage of the pelvic peritoneal cavity the abdominal route is the better.

Drainage material.—After giving a long trial to drainage by gauze

wicks, "cigarette" drains, and so forth, we have abandoned them all in favour of the simple rubber tube. It is questionable, to our minds, whether a gauze wick really does assist the flow of fluid through an opening, even when lightly packed. Certainly, when tightly packed it actually obstructs it, and its withdrawal is always followed by a gush of pent-up discharge. A gauze wick leaves a track along which, after its removal, fluid may subsequently make its way, and this is its solitary virtue.

Tube drainage has the advantage of acting as an immediate indicator of extravasation of blood, urine, or intestinal contents, if such occur, and the surgeon is at once apprized of the disaster. Gauze drainage, on the other hand, is very misleading, for bright blood filtering through it very often comes from the edges of the abdominal wound, while extensive intraperitoneal bleeding may be merely indicated by a sero-sanguinolent discharge, owing to the blood-corpuscles becoming entangled in the meshes of the material. And further, extravasated urine filters up so slowly that its small quantity diverts the mind from the possibility of a leak in the urinary apparatus; and we know of a case which ended fatally from this cause.

Management of the drain.—When drainage is employed merely as a precautionary measure, and not of necessity, we use a piece of $\frac{1}{4}$ -inch tube and withdraw it in from 24 to 48 hours. For regular drainage, $\frac{3}{8}$ -inch tube should be employed.

The tube should be left *in situ* for at least 48 hours, and may then be daily twisted round and then pulled up a little way and the excess cut off. The tube should be entirely withdrawn when the discharge is only serous and is reduced to a small quantity. It should not be left *in situ* after this, as its presence may excite a suppuration which would not otherwise have taken place. If the discharge is purulent, the withdrawal of the tube should be postponed for at least 5 days, i.e. till a definite track has formed down which it is easy to re-pass the tube after cleansing, or to substitute one of a somewhat smaller calibre.

Occasionally omentum may prolapse through a drainage track after withdrawal of the tube. In this event it must be gently replaced and the track plugged with gauze for 24 hours.

The tube must on no account be left *in situ* too long, since its pressure might cause perforation of damaged intestinal wall. It is a mistake to be in a hurry to irrigate the abscess cavity through the drainage-tube. If free drainage has been provided, irrigation for the first few days will do no further good, and may do harm by inhibiting the activity of the tissue-cells. Sinuses are frequently kept open solely by misapplied zeal in this direction. If, however, after the first few days the discharge is foul, irrigation is indicated. Peroxide of hydrogen, 10 vols., Milton solution, two drachms to a pint, or flavine solution 1 in 1,000 are all excellent for this purpose.

In conclusion, it is a matter of importance to prevent the tube from slipping into the abdominal cavity. For abdominal drainage, transfixion with a safety-pin is the most generally useful method, or the tube may be fixed by a suture to the wound edge. In vaginal drainage the tube must be lightly fixed to the cut edge of the vaginal wall by a piece of unfortified No. 1 iodine catgut. This will yield in a week and leave the tube free.

FIXATION OF TISSUES AND PRESERVATION OF SPECIMENS

Fixation.—It often happens that a surgeon will wish to remove a portion of tissue for microscopical purposes. The best method is as follows: The piece removed should be placed forthwith in acetic alcohol (absolute alcohol 2 parts, pure glacial acetic acid 1 part), in which it may remain from 30 minutes to 24 hours; after this it should be transferred to absolute alcohol, in which it may be kept until it is convenient to imbed it. This is a very rapid method of fixing, and, when necessary, small pieces of tissue may be cut in paraffin, stained, and examined within 4 hours of removal. If a quicker examination than this is required, the tissue had better be cut direct with a freezing microtome.

If acetic alcohol be not available the tissue may be placed in 50-per-cent. alcohol or in 5-per-cent. formalin until such time as it can be dealt with in the laboratory. The sections yielded from such methods are, however, much inferior to those obtained after the use of acetic alcohol.

Method for preserving specimens.—We have found the most satisfactory way to fix and mount specimens is that invented by Jores and modified by Rowntree, as follows (*Arch. Middx. Hosp.*, vol. x):

1. Immerse the specimen for 24—48 hours in

Sodium sulphate	20 gm.
Sodium chloride	10 "
Magnesium sulphate	20 "
Formalin	50 c.c.
Water	to 1,000 "

2. Immerse the specimen for 12—24 hours in 50-per-cent. naphtha-free methylated spirit.

3. Immerse the specimen for 4—6 hours, until the colour returns, in Pure naphtha-free methylated spirit.

4. Immerse the specimen for 2—3 days in

Sodium acetate	20 gm.
Glycerin	500 c.c.
Water	500 "

5. Immerse the specimen for 2—3 days in pure glycerin.

6. Mount the specimen in liquid paraffin.

CHAPTER III

OPERATING THEATRE AND APPOINTMENTS

OPERATING SUITE

IN most cases the surgeon will have to make the best of the theatre he finds at his disposal when he is first appointed to the staff. Operations are daily performed with the greatest success in the most unfavourable surroundings, and the surgeon must always remember that the results of his work will be due to his own forethought and skill rather than to a perfect theatre and its appointments.

It is, however, more encouraging for a surgeon to operate amidst surroundings as perfect as may be, and we shall now indicate what, in our opinion, these should be. The operation suite should consist of eight rooms: the operating theatre, the anæsthetic room, the surgeons' dressing-room, the immediate-preparation room, the disrobing room, the sterilizing room, the nurses' storeroom and the nurses' changing room (Fig. 39).

Theatre: light.—The daylight should be admitted through a window having, in the northern hemisphere, a northern aspect. This window should occupy the greater part of the north side of the theatre, and terminate 3 feet from the floor. The upper edge should be continued as a sloping skylight for 12 feet.

Artificial light is always a difficulty, and the method chosen must depend upon the funds in hand. The ideal method for general illumination is to have the electric light arranged round the walls of the room in such a way that, while avoiding an unpleasant glare in the eyes of the surgeon and his assistants, an even and comparatively shadowless light suffuses the whole theatre.

This diffused light, however, while necessary in the rest of the theatre, is insufficient for any operation carried on at a depth, and for such some system of focal light must be installed. A number of such systems are now on the market, all affording a more or less shadowless light.

A less expensive and simpler device is to have a number of lamps, like motor headlights, focused on to the operation area from various points of the theatre; but the drawback is the great heat produced.

In addition, a lamp movable on the floor will be required, attached by flex to a wall-plug which should lie flat with the wall. The lamp is preferably mounted on a stand on which it can be rotated to any position required, and should, if possible, be shadowless. If such cannot be obtained, a hand bell-light must suffice.

Every theatre should possess emergency lights supplied by batteries in case the current in the main should fail.

Ventilation.—The researches of Leonard Colebrook have conclusively proved the truth of Lister's original contention, that air-borne

infection is one of the major menaces of surgery. All operating theatres should be "air-conditioned," the air being forced into the theatre, not sucked out of it. Also it should be filtered. The installation of the apparatus to do this will be costly, but the time is rapidly coming when no theatre will be held to be complete without it (*see also* p. 34).

Floor.—The floor should be impermeable and capable of being washed, perfectly smooth, and not subject to roughening from traffic.

Walls.—Walls should be of some hard, smooth material resistant

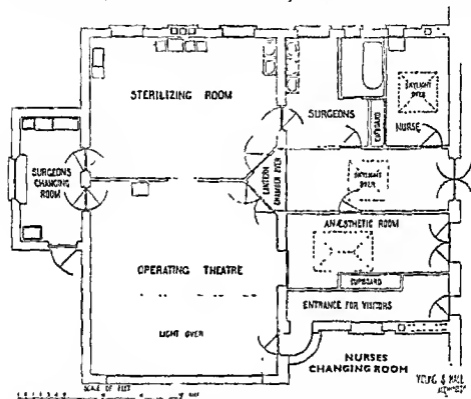


Fig. 39.—Plan of the operating suite of the Chelsea Hospital for Women.

to damp, of which there are many on the market, or they may be covered with parian cement, and then painted with as many coats of enamel as necessary. The surface resulting is very hard, perfectly smooth, and easily washed.

Ceiling.—A part of the roof of the theatre should be made use of for a skylight, set at an oblique angle to the window and continuous with it. The rest of the roof should slope down from the highest part of the skylight, and the ceiling should be made of a substance sufficiently smooth and dense to bear thorough washing. Cross beams or rods should not be permitted, as they collect dust. A flat ceiling should be avoided, for moisture condensed on it drips downwards.

All the angles between the walls, ceiling, and floor should be rounded and made smooth, and the frames of the doors and windows should be flush with the walls.

An arrangement whereby the glass of the skylight can be kept flooded by running water so as to keep the theatre cool in hot weather is very desirable.

Shelves.—Shelves should not be fixed in the theatre, but in an adjoining room, and should be so arranged that the bottles they support, containing the antiseptic solutions, can be seen through a glass panel in the wall through which the india-rubber tubes to deliver the fluid should pass.

Operation table.—The chief essential is a correct Trendelenburg position, i.e. the axis of the tilt should be in the position of the patient's pelvis. In some faulty tables this is not so, with the result that the abdomen and pelvis are inconveniently elevated when the table is tilted. The table should have a mechanism for raising or lowering it. A common fault with most operating tables is that while they can be raised to a totally unnecessary height they cannot be lowered enough to enable a short surgeon to operate on an obese patient without either carrying his arms or standing on a stool or platform, the first of which is very tiring and the second very irritating.

The patient should be fixed for the Trendelenburg position before the table is tilted, by firmly fastening her ankles to the end leaf of the table, previously dropped to a right angle. For this purpose slits should be cut in the leaf to take the straps which fix the ankles. Most instrument makers, while providing clumsy and dangerous shoulder-rests, omit this essential feature. Shoulder-rests should never be used, for, besides the risk of producing brachial paralysis, they cause the patient, especially if she be fat and heavy, to 'concertina' towards the rests, with the result that the distance between the pubes and ribs is decreased and the bowels are pushed down on the diaphragm.

It is a common mistake for the nurse to fix the ankles before the end leaf of the table is dropped, with the result that a considerable strain is thrown on the popliteal space if the knee joints do not lie precisely over the hinge of the table. An equally common mistake is to tilt the table before the end leaf has been dropped; if the tying is loose, the patient then slips towards the anæsthetist and the knee joints again fail to correspond with the hinge. Either of these errors may produce peroneal paralysis.

Other tables.—Four other tables are required: (1) anæsthetist's table; (2) instrument table; (3) swab table; (4) additional-material table.

The instrument table is preferably one with a swinging arm, so that it can be swung over the patient if the surgeon desires it, or so arranged as to form an extension to the knee-table about to be described.

Knee-table.—For all operations in which the Trendelenburg position

is used, Bonney's knee-table (Fig. 40), will be found most convenient. It is hung on the patient's knees after the table has been tilted and forms a slightly inclined plane on which instruments, after it has been covered by the sterilized sheet, may be placed without risk of their

slipping down on to the abdomen or between the patient's thighs.

Basins and bowls.—All basins and bowls should be made of porcelain enamel, which does not chip except under the roughest usage, and which can be boiled. For immersing the arms as well as the hands, long bowls carried in an enamelled iron frame are required. Two of these should be placed in the theatre within convenient reach of the operating table.

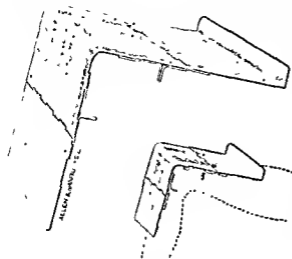


Fig. 40.—Bonney's knee-table.

Douche-tray.—It is necessary in vaginal operations to have some receptacle into which, if a douche is used, the fluid may run as it leaves the vagina. For hospital work we have always used the metal douche-tray devised many years ago by Stuck, a former resident officer at the Chelsea Hospital for Women. It can be detached from the table and sterilized between the operations. A similar device now forms a part of all modern operating tables.

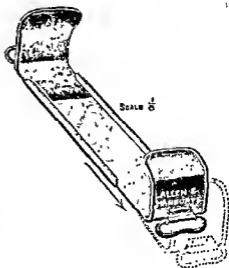


Fig. 41.—Patterson's arm-grip.

Arm-grip.—This is an admirable device for keeping the patient's arms to her sides during the operation (Fig. 41).

Anæsthetist's screen.—The pattern devised by one of us, including a horizontal leaf which, covered by a sterilized sheet, can be used to put instruments upon, will be found excellent for abdominal operations (Fig. 42). A wire screen over which a sterilized sheet is hung is provided on modern operating tables.

Stools.—Two metal stools, the seats of which can be screwed up and down, are required, one for the anæsthetist and one for the surgeon, the latter for operations in the lithotomy position. The best pattern for this stool is that illustrated in Fig. 43, which permits the operator to rest an instrument tray on his knees so that the instruments are accessible to his hand without the fatigue and waste of time involved in turning round.

Anæsthetic room.—This room should open into the theatre by a door which is kept closed until the patient is under. It should contain a cupboard in which the anæsthetic drugs and apparatus may be stored, and a table on which the anæsthetic register can be placed.

Surgeons' dressing-room.—This should contain wash-basins, benches for placing sterilizer drums upon, a cupboard for hanging clothes in, a shelf along which the notes of the patients to be operated on are arranged upright and in order, and some chairs and a table. A bathroom and lavatory should be adjacent to it and it should open into the immediate-preparation room.

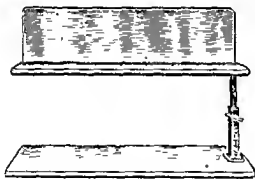


Fig. 42.—Bonney's anæsthetist's screen.

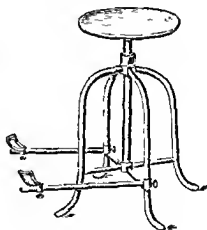


Fig. 43.—Bonney's stool with foot-rests.

Immediate-preparation room.—In this room the final preparations of the surgeon and his assistants are made, and the instruments and ligatures sterilized.

There should be long porcelain troughs into each of which water is delivered by jets controlled by foot-taps, and so arranged that cold, hot, or tepid water can be delivered at will. Above the trough a glass shelf should be fixed to hold the soap and nail-brush boxes. The room should contain metal tables to hold the drums containing the sterilized material, instruments and other apparatus. It should have fixed in it sterilizers (if possible worked by steam, cowled, and with an exhaust fan and surrounded by a cold water jacket, to prevent steam escaping into the room when the lid is opened) for the boiling of

instruments, ligatures, dishes, basins and bowls, and all other things which cannot be conveniently sterilized *en masse* by the sterilizing plant contained in the main sterilizing room. A shelf for holding the large glass jars containing antiseptic solutions has been already mentioned, and an apparatus for the delivery of hot and cold sterilized water should also be fixed in this room, the taps projecting through the wall into the operating room. This immediate-preparation room should lead directly into the theatre.

Main sterilizing-room.—This room should contain a steam sterilizer for dressings, gowns, masks, sheets, towels, and gloves. This room is better not placed in close proximity to the theatre because of the heat and steam, and it may very well be situated in the basement close to the boilers, and connected to the theatre suite by a special lift.

Nurses' store-room.—This room should be furnished with a large table and some chairs; and here all cutting out, sewing, and other necessary work should be done. It should, therefore, contain wash-basins, besides cupboards in which can be kept overalls, towels, sheets, mackintoshes, dressings, and all other theatre stores. Here also should be kept the instrument case, made of glass and metal, and let into the wall if possible, so that its door is flush with the wall. The room should be in communication with the immediate-preparation room.

Nurses' changing-room.—In this room the nurses change their outer clothes, wash their hands, and put on their gowns, masks and theatre boots, preparatory to final preparation in the immediate preparation room. It should contain cupboards, tables to put drums upon, and several wash-basins.

Disrobing-room.—One of the chief defects of many operating suites is the failure to provide a room wherein the surgeon and his assistants may remove their soiled overalls, gloves, and masks, and into which all contaminated articles, such as soiled towels, basins containing specimens removed at the operation, blood, or pus, or the dirty instruments, can be removed. More often than not the immediate-preparation room has to serve for this purpose—obviously a grave fault of arrangement. The disrobing-room should contain a washing-trough for the hands, a second trough for washing the instruments and basins, a sink for contaminated fluids with a flushing cistern over it, a metal receptacle on wheels for the soiled linen which is to be washed, and one for all articles to be destroyed. In the latest theatres a special shoot is installed, down which all contaminated linen may be passed directly to the basement. This room should lead immediately off the operating theatre, and should communicate by another door with the

is quite close to the patient it is difficult for him to see the details of the operation. In hospitals in which a large number of students have to be accommodated some sort of a gallery or stand is a necessity. Visitors must wear overalls and masks, which should be supplied from the nurses' room. A place must be provided where they can leave their coats.

STAFF OF THE OPERATING THEATRE

In ideal circumstances, such as in hospital practice, the surgeon, if employing the usual technique, requires, in our opinion, a staff of seven if the operation is to run perfectly smoothly and the technique is to be as aseptic as it is possible to make it. In private houses this number is rarely possible, and five is the most that one can usually obtain. More than seven is inadvisable, for the greater the number of people who are touching the instruments and the operation area, the greater chance will there be of septic infection. The safest plan is to reduce the number of the staff to the most efficient minimum, but below this the risk-curve rises, because at one moment one of the assistants may have to perform duties which cannot be in keeping with surgical cleanliness, and at the next moment may be called upon to perform duties which ought to be so, and thus the aseptic technique breaks down.

In hospital the operating team should consist, besides the surgeon, of—

1. First assistant.
2. Second assistant.
3. Anæsthetist.
4. Ward sister.
5. Theatre sister.
6. Two general nurses.

Some surgeons dispense with the ward sister, and do her work themselves with the aid of the first and second assistants. Such an arrangement will serve for minor operations, and in private work often has to suffice for any operation, but for major operations it is a drawback to the operator to take on duties other than those of the operation itself. If dry swabs are used, the ward sister is not a necessity, because wringing out is not required. Nevertheless, she may be usefully employed to keep count of their number and exercise a general supervision over their use.

DUTIES OF THE STAFF

The general arrangement of the theatre during an operation is indicated in Figs. 44, 45.

First assistant.—A good first assistant is made, not born. His



Fig. 44.—Positions of the staff during an abdominal operation.

[From a cinematograph by Dr Alexander Wilson]



Fig. 45.—Positions of

duties can only be perfectly learnt by a long apprenticeship thoughtfully served. Self-abnegation should be his keynote; he should neither offer advice when it is unasked, nor take upon himself any of the manipulations proper to the surgeon, unless requested to do so; he should be silent, watchful, and keep his head and hands out of the wound. He should, of course, direct the attention of his chief to any point which the latter has obviously overlooked. The position of the first assistant in an abdominal operation is generally on the left side of the patient, opposite to the operator, but in a vaginal operation he is on the right side of the patient, so that his right hand is at the service of his chief. One of his main objects should be to give the operator as clear a view as possible by properly retracting the wound or holding intervening parts out of the way, as may be necessary, and in this regard it may be mentioned that the assistant is at first apt to forget that the structures on the side most visible to him are, by reason of the position of the operator, least visible to the latter. He should concentrate his mind on how best to facilitate the actions of the surgeon, whether he is in agreement with him or not, and to anticipate them so that his chief is spared the fatigue of having to direct him. These qualities are quite distinct from those required by the operator himself; and, indeed, many good surgeons are bad assistants, and conversely, though much less likely, a good assistant may be a poor operator.

Second assistant.—This assistant's position in an abdominal operation is at the right hand of the operator. In a vaginal operation he stands on the patient's left side. His duties consist chiefly in anticipating the wishes of the operator in regard to the instruments he requires, to do which he should studiously acquire a knowledge of the technique usually followed in abdominal operations. He acts as liaison officer between the surgeon and the theatre sister. It is, therefore, a post of the greatest educational value to those who intend to follow a surgical career. The second assistant must also be ready to lend help in retracting the wound-edge on his side, and to carry out such other duties as the surgeon may direct.

Anæsthetist.—It is a great advantage to any surgeon to have as his anæsthetist one who is accustomed to him and his particular kind of work, and in gynæcological surgery, next to the operator himself, the anæsthetist is the most important member of the team. Inept operative assistants, imperfectly trained nurses and disadvantageous surroundings can be coped with, though at the cost of much extra strain, but it is impossible to achieve first-class abdomino-pelvic surgery without a first-class anæsthetist.

The anæsthetist is responsible for the choice of the anæsthetic after he has duly informed himself—preferably by a preliminary visit—of the patient's physical condition and the nature of the operation it is

proposed to perform on her. In making the choice he will necessarily be considerably influenced by the surgeon's opinion, and it is the latter's duty, therefore, to give the anæsthetist the fullest information possible and, if there are any special points about the operation in connexion with which difficulty is anticipated, to let him know of these beforehand so that he may be better prepared to co-operate in overcoming them.

The anæsthetist must inform the surgeon when at any time the patient's condition seems to be getting seriously worse. He should not allow himself to be influenced in any way by remarks of the surgeon as to changing the anæsthetic, 'pushing it,' and so on, if the patient's life is likely to be endangered thereby, for should the patient die of the anæsthetic, the responsibility will rest upon the anæsthetist and not upon the surgeon. If the operating table is moved by a screw or any other apparatus near the patient's head, the anæsthetist will raise the table to the angle required.

We had the great good fortune to work for a very long period with a master of the anæsthetic art, the late Herbert Charles; and, looking back over the years at our strenuous endeavours in the operating theatre we acknowledge with grateful hearts how much of their success was due to him and to the other expert anæsthetists with whom we have been or still are associated.

Theatre sister.—The theatre sister will be responsible for the proper sterilizing of all instruments, ligatures, sutures, dressings, surgeons' and nurses' overalls, masks, towels, swabs, and gloves; also for the preparation of antiseptic solutions for the hands. Her place during the operation is at the instrument table, where she threads the needles and supervises the instruments and hands them to the second assistant, or, in the absence of such, to the surgeon, as he may ask for them.

Ward sister.—The duty of the ward sister is to hand the swabs from the tin in which they have been sterilized, or wash them if wet ones are being used. During hospital operations she will be held responsible for the number used, although the surgeon should satisfy himself before he closes the abdominal wound that there are none missing. In private work, on the other hand, the sole responsibility rests on the surgeon. If dry swabs in large numbers are being used, she may find it difficult to tell the surgeon at once, when he asks her, how many swabs she requires to make her number correct, and she will find it easier on this account to have the swabs done up in packets of 5 before they are sterilized, and the total number of swabs in the box written down on a piece of paper before the operation commences. The ward sister will also hand out the sterilized towels, dressings, gauze, and binder, if used, as the surgeon requires them. When there is only one general nurse the ward sister, before she puts on her sterilized gown and gloves, will have to assist her to get the patient ready on the table.

General nurses.—The general nurses will be required to fetch and carry porringers and boxes with sterilized towels and dressings therein, to prepare fresh antiseptic solutions, get ready saline infusions, sterilize any additional instruments that may be required, and generally to make themselves useful. They arrange the various tables, get the patient ready on the operating table, fixing her legs if necessary, tucking the night-dress up and removing the binder and pre-operative dressing.

Health and cleanliness of the operator and staff.—It goes without saying that all concerned in the performance of an operation should be in good health, and should not be suffering from any septic condition such as sore throat, nasal disease, or septic wounds on the fingers, and if any of the assistants has been in contact with a septic case before the operation, he or she should have had a hot bath and an entire change of raiment just before coming to the operation. The teeth of surgeons and nurses should be kept in perfect order.

The hair of the operator and of his assistants should not be unduly long, and the nurses' hair should be kept well brushed and cleaned. The surgeon has little control over the toilet of a nurse, but at any rate he need not employ an untidy woman. Doctors and nurses should, at all times, be most particular in keeping their nails clean. One has seen an operator commence the preparation of his hands by a vigorous cleaning of dirty nails with nail-scissors and scrubbing brush, when the nails to commence with should have been reasonably clean.

A surgeon should at all times avoid contact with infected or possibly infected material. It is better to keep the hands free of septic bacteria than to rely upon destroying them afterwards by washing and antiseptics. It argues well to see those concerned with surgical operations fastidious and dainty in their habit of life outside the precincts of their work. An operating theatre is no place for a sloven, be he or she ever so scrubbed up for the occasion.

COSTUME OF OPERATOR AND STAFF

Operating suit.—The surgeon and his assistants should change their clothes for a suit of white ducks. Nothing looks more slipshod than a man operating in his outdoor clothes covered by an overall. Changing into an operating suit spares the surgeon the definite risk, discomfort, and expense of leaving the hot theatre with his clothes clammy with perspiration and very likely soiled with blood or pus. His outdoor boots or shoes should be covered with a pair of white rubber boots large enough to slip over the booted foot. If special boots be not available, they may be replaced by mackintosh or linen covers, the upper end fastened by a running tape above the knee, the lower end being shaped like a boot. Over his suit he should wear a mackintosh apron long enough to come below the top of his boots. It should be suspended by tapes over his shoulders, not round the nape of his neck.

Overalls.—Overalls should be made of thin linen, should fasten up at the back, and should have sleeves down to the wrist.

Masks.—Masks should be worn by all concerned with the operation as well as by visitors admitted to the floor of the theatre. To prevent spray infection effectively, the part of the mask over the mouth and nose must consist of several layers of gauze. Some surgeons wear a cap, separate from the mask, but we prefer a mask large enough to cover the head as well. A single pair of tapes is attached to the mask in the same horizontal line as the opening in it. These are brought round behind the head, tied by a single hitch and then brought back again to be finally tied under the chin. A mask which covers the nose has the drawback of clouding the wearer's spectacles if he uses them. This can be obviated by smearing the lenses with damp soap and then rubbing this off with a towel, or by wearing two masks, one over the other, the first put on leaving the nose out and the second put on including the nose.

Gloves.—Sterilization is best effected by steam heat, but this requires to be very carefully done, otherwise the interior of the gloves will be so damp that they are difficult to put on. They must be well powdered with French chalk before they are put in the sterilizer, but yet not so excessively that the chalk accumulates in a lump at the finger tips to the impairment of the tactile sense.

Steam heat causes more rapid deterioration of the glove than boiling. If steam heat is not obtainable the gloves should be boiled and then placed in sterile water, filled with which they are put on.

Though we disapprove of antiseptics applied to the bare hand, as sooner or later bound to cause roughening of the skin, we use them in full strength applied to the gloved hand, our usual practice being to have a bowl of 1-in-500 biniodide of mercury immediately adjacent to the operator and the first assistant, in which they rinse their gloved hands at frequent intervals, partly for antiseptics and partly to prevent slipperiness. To keep the wrists of the gloves from slipping off the sleeves of the overall elastic bands are very efficient. They should be sterilized with the gloves.

CHAPTER IV

OPERATIONS IN PRIVATE HOUSES

OPERATIONS in private houses are becoming rare in the big centres of population, where hospitals or nursing-homes are situated within easy reach. Of those still carried out in the patient's home, a good proportion are in the houses of the wealthy, who can afford to turn part of their establishment into an efficient nursing-home for the time being. The remainder consist of cases in which the patient is so ill that transport to the nearest hospital or home is impossible. It is otherwise, however, in remote districts separated, perhaps, from the nearest institution by many miles of bad roads—in such circumstances the surgeon will commonly or even habitually have to depend on himself alone. Surgery under such a handicap is a very different proposition from that carried out with the full gamut of hospital assistance, but we hold that a surgeon is not fully seised of his art unless by practical experience and equipment he has rendered himself independent of the conditions under which he may have to operate.

When an operation is to be performed in a private house, the whole responsibility for the details concerned in it rests on the surgeon, and it will be necessary for him not only to prepare his own outfit but to give minute directions to the nurse in charge as to all arrangements required for its performance.

THE SURGEON'S OUTFIT

Although the instruments required for any given operation are necessarily the same whether it is to be performed in a hospital or at the patient's home, it is advisable in the latter case to carry sufficient additional ones, so that in the event of the operation turning out to be of a different nature from the one anticipated, the surgeon may not find himself embarrassed at the last moment by absence of the proper tools.

These additional instruments need not be sterilized, but should be carried in the bag in case they should be required.

Thus, when performing a minor operation, sufficient pressure forceps, ligature material, and a scalpel should always be at hand, lest it be necessary to open the abdomen. Similarly a pair of bowel-clamps

should always be carried in case a portion of the intestine may have to be resected.

The methods of sterilizing the instruments and the rest of the surgeon's outfit for work in private houses and, to the surgeon, little-known nursing-homes, and the best means of their transport, will be found fully described elsewhere (pp. 27 and 28).

ARRANGEMENTS FOR THE OPERATION

Preparation of the room.—A well-lighted room should be chosen, and one preferably situated near a bath-room. All superfluous furniture should be removed. The day before the operation, if that amount of time be given, the walls should be well dusted, and all the woodwork, including the tops of the doors and windows, washed or dusted with damp dusters. The furniture also should be dusted, the carpet taken up and the floor thoroughly washed with soap and water. If, however, there is insufficient time for this preparation, owing to the urgency of the operation, it is better not to disturb the dust, but simply to push the furniture gently on one side, and place a sheet over the carpet beneath the operating table.

Light.—If the operation can be performed in the daytime, the light obtained from an ordinary window is sufficient. If it is overlooked it must be obscured with a sheet of gauze, or rubbed over with whitening. If the operation has to be performed at night the difficulty of obtaining sufficient light may be considerable. When electric light is installed in the house, the largest possible bulb should be fixed in the pendant under which the table is to be placed. When it is not installed the surgeon, if the operation cannot be postponed till daylight, will have to work by the light of an electric torch, or he may disconnect one of the headlights of his car and bring it into the room by means of a long piece of flex, which should always be carried by those working under conditions in which such an emergency is possible.

Bed.—A single iron bedstead with a spring and horsehair mattress should be procured, and the bed made as follows, from below upwards: a blanket, lower sheet, mackintosh sheeting, drawsheet, upper sheet, blanket. In cold weather hot-water bottles may be used to warm the bed before the patient returns to it, but all of them must be taken out before the patient is put back. In cases in which shock follows the operation, hot bottles, if used at all, must be applied outside the blanket. It is better, however, whenever possible, to dispense with them altogether and wrap the patient in a blanket until she has recovered from the shock.

Operation table.—Every operating surgeon should have his own portable operating table. Most of those on the market are designed for general surgical purposes and give an unsatisfactory Trendelenburg

tilt. The table that one of us has designed will be found in this respect simple in mechanism and light to carry (Fig. 46). It should have on it one blanket, a piece of mackintosh, and a sheet. In the absence of

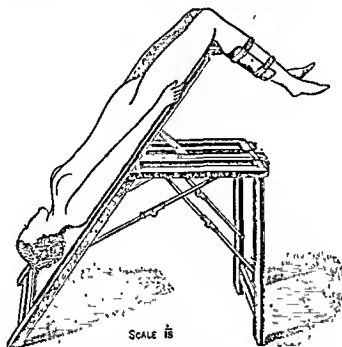


Fig. 46.—Berkeley's portable table.

some such table the best substitute is a narrow kitchen-table, which, if the Trendelenburg posture is required, may be tilted on blocks or a travelling trunk or packing case.

Instrument and other tables.—Five small tables will be required: one for the anæsthetist's apparatus, one for the instruments, one for a basin of biniodide of mercury, r in 500, for the hands (if the instrument table is large enough this can be placed upon it, or a chair can be used), one for the basins to hold the swabs, and one to place the sterilized outfit upon. If suitable tables cannot be procured, an ironing board, or leaves of an extension table resting on chairs, will answer the purpose. The tables should be well dusted and covered with clean towels over which sterile towels are subsequently laid.

Washstand.—If a fixed lavatory basin is available so much the better. In the absence of such there should be a table with three basins: two for washing the hands with soap and water, and one containing a solution of biniodide of mercury, r in 500, for completing the preparation of the hands after the rubber gloves have been put on. If the gloves have been boiled they should be turned into a basin of boiled water.

Chairs.—Two chairs are required: one for the anæsthetist, and one (in the case of vaginal operations) for the operator. If the operation

necessitates the Trendelenburg position, it would be better to have a stool or a low chair for the anæsthetist to sit on.

Pail or foot-bath.—This should be properly cleansed, and is necessary for the reception of any soiled water, while in vaginal operations it is necessary to have such a receptacle for the douche to flow into on leaving the vagina. A piece of oilcloth beneath it will protect the carpet or floor.

Linen.—Besides the sterilized outfit that the surgeon brings with him (*see p. 27*) a number of old towels will be needed: a dozen will be sufficient for any case.

Temperature of room.—The temperature of the room should be between 70° and 75° F., but an open fire or gas or electric stove must be put out before the anæsthetist begins, for fear of igniting the ether. If chloroform is used in a room with an open or gas fire, the vapour becomes decomposed and forms a gas very irritant to respire. A rapid way of warming a cold room is to pour some methylated spirit into a metal bowl and then set it alight. Care must be taken in doing this.

Accessories.—The nurse must provide the following accessories:

A nail-brush that has been sterilized by boiling.

A new cake of soap.

A bottle containing brandy.

A long rubber rectal tube.

A large-sized soft rubber catheter with a glass funnel attached for administering saline or brandy enemata.

A bath thermometer to test the heat of solutions.

Some table salt (not Cerebos or any modified form of salt) in case the surgeon wishes to give a saline injection.

Water.—Three gallons of cold water which has been boiled must be provided, and 3 gallons of water must be boiled just before the operation. Pieces of gauze should be tied over the top of the jugs; provision should be made for a further supply of water in case it should be needed. In emergency the water drawn from the hot-water service tap will suffice.

Instruments.—It is customary for the surgeon to bring with him his instruments ready sterilized, together with the ligatures, gloves, dressings, aprons, masks, towels, and swabs, but if emergency compels him to sterilize them on the spot, a large saucepan, or preferably a fish-kettle, filled with water and boiled over the kitchen fire, will suffice. The instruments should be wrapped in a towel or a linen bag.

Basins and dishes.—It is simplest for the surgeon to lay out his instruments and swabs on a table covered by a large sterilized towel. For a major operation, two wash-basins will be required for the swabs; for a minor operation, two large pudding basins, one for the clean and one for the dirty swabs. These dishes should be boiled if possible, or

at any rate scalded or burnt out with methylated spirit before use, and then, having been turned upside down on a sterilized cloth to keep out all dust, should be covered with towels until required.

Three additional bowls are required, two to contain antiseptic solutions and one to contain sterile water in which gloves may be put on. A pint measure is needed for mixing the solutions, and for making saline solution if necessary.

Ligatures.—Silk, thread, and silkworm-gut should be boiled for half an hour. The sterilization of catgut is beyond the province of a nurse.

Gloves.—If the surgeon does not bring with him his gloves ready sterilized, they must be boiled for 20 minutes. The nurse must not forget to wet them inside beforehand, otherwise the air contained in them will prevent the boiling water reaching their interior. Unless contained in a perforated metal box—as we advise—they should be boiled separately from the instruments if possible, so that they may not be holed. When sterilized they should be transferred to a large bowl of boiled water.

Sterilized overalls, towels, and swabs.—In most large cities tins of ready-sterilized operating outfit may be obtained from business houses which specialize in them. Many surgeons have put up for them a special tin to suit their own requirements. When such is not available the surgeon should possess his own sterilizer, or have the use of one (*see p. 27*). When none of these things is obtainable and the nurse has herself to prepare an outfit, she must see to the following points:

Overalls.—It is impossible to sterilize overalls in a private house. If, therefore, the surgeon does not bring his own, they had better be dispensed with, and clean towels used instead to swathe the operator and his assistant.

Towels.—The towels for surrounding the operation area should be sterilized by boiling and afterwards transferred to a 1-in-1,000 biniodide of mercury solution. When required for use they must be wrung out. As they must of necessity be used wet, between them and the patient pieces of waterproof batiste should be placed. A similar arrangement will be needed if they are used instead of overalls for the surgeon and his assistant.

Swabs.—These should be sterilized by boiling for one hour, and afterwards transferred to a 1-in-1,000 solution of biniodide of mercury. They must be wrung out in plain sterilized water before use.

CHAPTER V

EXAMINATION AND PREPARATION OF THE PATIENT

I. BEFORE THE OPERATION

EVERY patient, before being subjected to any operative procedure, should undergo a certain amount of preparation at the hands both of the surgeon and of the nurse, and only in operations of a very urgent nature, as, for instance, a ruptured tubal gestation associated with an alarming internal hæmorrhage, should this preparation be dispensed with. The amount of preparation necessary depends upon whether the operation is of a major or minor kind, and on the state of health of the patient.

EXAMINATION OF THE PATIENT

It is the duty of the surgeon to acquaint himself with the general condition of the health of the patient before he operates upon her, especially as regards her heart, lungs, and kidneys, since their condition may have an important bearing upon the result of the operation. It is quite obvious that if, apart from the condition which brings her to the surgeon, the patient is suffering from some serious disease, an operation on the score of expediency is contra-indicated, and one should only be performed when absolutely necessary to save life or for the relief, perhaps only temporary, of some distressing local condition.

Even when the cause of her poor general state is the disease for which she needs surgery, it may be wiser to postpone operative measures for a short while. For instance, women who have been flooding until they are intensely anæmic are bad subjects for operation. The heart is flabby and weak, and in danger of failing under the stress of a severe operation, and the profound anæmia predisposes to femoral or other thrombosis with all its attendant risks and discomforts after the operation. Many of these patients are better not operated upon until the next period is nearly due, and in the meantime measures should be taken to improve the general health by massive doses of iron (up to 100 grains a day of the sulphate), liver extract, and, in extreme cases, blood transfusion by continuous drip.

It must also be remembered that the anæsthetist's choice of the anæsthetic is influenced by the report given to him of the patient's general health.

The shock following a major operation can be severe, and is sometimes the direct cause of death. It may therefore be that whereas the general condition of the patient would not contra-indicate a slight operation, one of a serious nature would be highly dangerous. Prior to a severe operation on a very enfeebled subject, a hypodermic injection of liq. strychninæ mij is with advantage given twice daily, or the same amount in a mixture three times daily.

In hospital practice it sometimes falls to the lot of a surgeon to have to operate upon patients who are debilitated by a life of constant hard work and hardship amidst insanitary surroundings, and who have been in daily want of sufficient and wholesome food, while some of them have, in addition, still further diminished their resisting power by alcohol. When a major operation is contemplated on a patient such as this, it is advisable to keep her in bed and feed her up for at least a week beforehand.

Cardiac disease.—Heart disease is not necessarily a contra-indication to operative measures, although obviously these cases assume a more serious aspect, since shock itself is a powerful depressant of the heart. Patients with compensated valvular disease stand all ordinary operative procedures as well as healthy persons, but when compensation is failing an operation should not be undertaken, except of urgent necessity. From the surgeon's point of view, fatty degeneration of the cardiac muscle is the gravest of all heart lesions, and the more so because its presence is with difficulty diagnosed before the operation. The most valuable indication of cardiac degeneration is the detection of sclerotic changes in the accessible arteries. On this account the surgeon should never forget to examine the radial artery at the wrist and the brachial artery at the bend of the elbow. A tortuous condition of these vessels, especially when combined with an alcoholic history, is an almost sure sign of a heart enfeebled by fatty degeneration. These patients bear severe operations exceedingly badly, the rapid heart-action thereby induced leading not infrequently to acute dilatation, which often proves fatal in a few days. In all cases in which there is a doubt as to the cardiac condition, the blood-pressure should be taken and, if it affords help, an electro-cardiographic examination should be made.

High blood-pressure, unaccompanied by cardiac insufficiency, does not contra-indicate an operation, and we have successfully operated on many such cases.

When the surgeon has reason to suspect, or knows, that the patient's heart is defective he must inform the anæsthetist, for chloroform, specially, is dangerous in certain cardiac states, and spinal anæsthesia under conditions of abnormally low blood-pressure (*see* p. 82).

Extreme anæmia.—Women who are only moderately anæmic go through major operations as well as persons with normal blood, and we are not in favour of pre-operative blood transfusion for them, as it may

increase bleeding during the operation. On the other hand, the surgeon sometimes sees patients who, by continued bleeding, have been reduced to a condition that might be called 'terminal anæmia.' The skin is yellowish-white, the pulse rapid, the temperature raised, and the mental condition abnormally alert. Before blood transfusion was perfected, the surgeon had to cope with these cases unaided, and had to rely on speed alone. Nowadays, drip blood transfusion can raise the blood content of these patients to a remarkable degree, altering the whole outlook for operation. There still remain a few anæmic patients who continue to bleed so profusely that operation cannot be delayed; in their case blood transfusion and operation should be simultaneous.

Pulmonary disease.—Ether has a tendency to cause bronchitis or broncho-pneumonia. If, therefore, on examination of the patient, the surgeon should detect any signs of bronchitis, he must postpone the operation until these have cleared up. If the operation is imperative, chloroform or gas-and-oxygen or intravenous or spinal anæsthesia must be employed; not ether. Patients suffering from pulmonary tuberculosis take inhalation anæsthetics badly and run the danger of an acute exacerbation of the disease. It is unwise to operate on a patient just recovered or recovering from a 'cold,' a sore throat, or influenza unless the urgency of the case compels it, for the anæsthetic may set up bronchitis or broncho-pneumonia.

Renal disease and diabetes.—The urine of the patient should always be carefully examined for albumin, blood, sugar, and pus before an operation is undertaken, and the quantity passed in the 24 hours should be measured. A patient with sugar in her urine should not, as a rule, be subjected to an operation, unless it be absolutely necessary, until her urine is sugar-free. The exceptions are those cases in which a blood-sugar test shows the glycosuria to be 'benign' (low-threshold glycosuria). In all other varieties the disease must be treated with insulin—or the more modern zinc protein insulin—by a physician skilled in this branch, and the operation postponed until the physician announces that it may be undertaken. When it is impossible to postpone the operation, the two great risks to be guarded against are coma and gangrene, both of which appear to depend upon the presence in the blood of β -oxybutyric acid and diacetic acid. Operation should be preceded by an intravenous injection of 40 units of insulin in 5 per cent. glucose solution. The same treatment is proper for coma or gangrene. If insulin is not available, the risk of coma and gangrene may be lessened by the exhibition of large doses of sodium bicarbonate for some days beforehand; and at the operation we have injected, intravenously, a bicarbonate-of-soda solution containing 2 drachms of this drug to 2 pints of sterilized water. In cases of post-operative diabetic gangrene we have seen remarkable improvement rapidly follow the administration

of large doses of sodium bicarbonate by the mouth. The starvation caused by post-operative vomiting may make it impossible to give a patient sugar to counterbalance the insulin, and cases of hypoglycæmic coma brought about in this way are on record. The proper treatment is immediate intravenous infusion with 5 per cent. glucose solution.

If albumin is detected in the urine, the patient should, if possible, be treated until the amount has considerably diminished or disappeared. Patients with renal disease do not stand major operative measures well.

Thyroid tumours.—Patients with simple goitres, so long as these are not interfering with the respiration, bear operations as well as other people; but when symptoms of Graves's disease are present the case is different. Such patients take the anæsthetic badly, and there is a liability to sudden death during the operation, or uncontrollable heart hurry and failure in the days immediately succeeding it. Nevertheless, we have operated successfully on many patients suffering from active Graves's disease. An estimation of the value of the heart by electrocardiography is of the greatest use in determining whether to operate or not. There are occasions, however, when the urgency is too great to allow of this being done, and the surgeon must then make the operation as little severe as he can by doing no more than is absolutely necessary, and doing it in the shortest possible time.

Insanity.—We have performed operations, both major and minor, upon insane patients, and have not found that the post-operative convalescence or the mental condition was adversely affected as a result. There are certain abnormal mental conditions which undoubtedly are secondary to physical disease and which improve or clear up altogether when the underlying cause is removed. The cause is sometimes gynæcological. The mere effect of an operation temporarily improves some forms of insanity, notably dementia precox associated with persistent subnormal temperature, low blood-pressure, and poor circulation. We have known patients of this sort become perfectly sane for several days after an operation, the recovery corresponding with the period of post-operative fever. When the temperature falls, the mental symptoms return. A surgeon should not undertake an operation upon an insane person, except in great urgency, unless he has been advised by a mental specialist that the result of the operation would be beneficial to her, and has obtained the written consent of those responsible for her.

Besides patients actually insane, there are those whose mental stability is trembling in the balance, and in these more than in any others it is proper, both for the good of the patient and for the protection of the surgeon, to take the advice of a mental specialist before performing an operation.

Pregnancy.—If during the routine examination of his patient before operation the surgeon should discover that she is pregnant, he may

decide not to operate until after the birth of the child, because of the liability, especially in some women, to miscarriage even after slight operations. On the other hand, the urgency for the operation may be so great as to outweigh this drawback. In other cases an operation of necessity but not of urgency may be justifiably postponed until the child has reached viability.

DIRECTIONS TO THE NURSE

It is a matter of primary necessity that the nurse, or nurses, should have been thoroughly trained and have an adequate knowledge of asepsis and antisepsis, and how to prepare themselves and the patient for operation. In hospitals and good nursing-homes the surgeon should lay down a routine to be followed in all cases, and for its execution the ward and theatre sisters are to be held responsible. In a well-organized institution, possessed of the services of highly-trained and intelligent women, much responsibility is thus removed from the shoulders of the operator, but it still behoves him to exercise a general supervision over the ward and theatre work, and, without harshness, to insist that it be properly performed. If the operation is to take place at the patient's house the surgeon cannot delegate his responsibility in this manner, and he should, therefore, be careful to choose fully competent nurses and to give them minute directions for preparing the patient, preparing the operating room, and sterilizing the instruments (if he does not do this himself). To a surgeon who is frequently operating, it will be found both convenient and a great saving of time if he has his directions printed, so that the nurse can be given a set. Unless the nurse is given a list of the requisite articles, she cannot be held responsible if anything is forgotten.

COMMUNICATIONS TO THE PATIENT AND HER FRIENDS

If the patient is a married woman, her husband should be informed of the exact nature of the operation, together with its probable results and risks, as estimated from the practice of experienced surgeons. If she be single, then her mother or nearest living relative should be informed of these details.

Exactly how much should be told the patient is a more difficult matter to decide. The patient has every right to know the worst as well as the best, and if she requests to be informed of the exact degree of danger so far as experience shows, she should be told. The only way in which this can be conveyed to her is by telling her of the death-rate in similar cases with skilled operators under favourable conditions; and this should be done. As a rule, the patients themselves are not so inquisitive as this, and the most they will ask is whether the operation

is dangerous or not, the answer to which will depend on the nature of the operation. With major operations the patient must be told, if she asks, that there is an element of danger, and; if the condition warrants such a statement, that this is only slight, and certainly nothing approaching to that which she must run if the disease is left untreated.

In a few cases, but only a very few, when an operation is necessary to save life and when the patient is so nervous that the truth as to the danger involved might ensure her refusal to submit to it, the gravity of the operation may be somewhat minimized, with the consent of the husband or nearest relatives, after they have been put in full possession of all the facts. If the operation is of such a nature that both Fallopian tubes or both ovaries, or the uterus will have to be removed, the patient and her husband if she be married, or the patient and her parents if she be single, must be made thoroughly to understand that the results will be sterility, or stoppage of the periods and sterility, and if both ovaries are removed, the climacteric.

The question whether a patient having cancer should be told from what she is suffering is very important. Our own opinion is that, as a rule, this fact should be concealed from her even to the extent of downright falsehood, though her husband, or in his absence her nearest relative or other responsible person, must of course be told. The knowledge that she had cancer will make the patient miserable from apprehension for years after the operation, so that if the disease presently returns, the lengthening of life that the operation effected will be of little gain to her, and if it does not return, part of the benefit of the cure will have been irretrievably lost. There are certain cases, without doubt, where the truth must be spoken, as, for instance, those in which concealment would prevent the patient from making domestic or business arrangements vitally important to her or hers, but they form a minority. For the rest we hold that humanity is best served by merciful lying.

The surgeon should, before he performs a major operation, obtain from the patient a letter, signed and witnessed by her husband or nearest relative, giving him a free hand, and in addition, if the operation is likely to result in the removal of the uterus or ovaries, what this entails should be explained to the patient either by the surgeon or the sister of the ward. This is now a rule in most hospitals for all serious operations on patients, and it would be better if it were so in private work. The neglect of this simple precaution has caused much trouble and anxiety to some surgeons in the past. Written consent from both wife and husband should also be obtained in all cases in which it is proposed to tie or remove the Fallopian tubes for the purpose of preventing conception. A surgeon must not operate upon a woman living with her husband without his consent. Such advice may have to be obtained by telephone, telegram or cable. Only in the greatest urgency can

escape from the bowel on the operation table and the operation area is in danger of being fouled

There are certain operations in which a far longer preparation of the bowels is necessary, as, for instance, in operations on the rectum, when a degree of chronic intestinal obstruction is present. In such, for at least a week beforehand, sulphate of magnesium in ʒ-drachm doses should be administered three times a day so as to produce a free evacuation, and every morning the bowel should be thoroughly washed out from below. By this *régime* a considerable degree of obstruction with its resulting intestinal distension may be overcome, to the great advantage of the operation.

Bladder.—The bladder should be emptied by catheter when the patient is under the anæsthetic.

Dress.—The patient should have on a clean nightgown, flannel dressing jacket, and a pair of clean flannel drawers, or, better still, long woollen stockings reaching to the groins. The hair is dressed in a plait, and any false teeth should be removed before the patient is anæsthetized (But see p. 34.)

Food.—Up to the day of the operation the patient may have her ordinary diet, supposing it to be a judicious one, and at 6 a.m. on the day of the operation, if this is to take place at 9 a.m., she is given a cup of tea. If, however, the operation is not to take place till 2 in the afternoon, at 10 a.m. half a pint of beef-tea is allowed, and nothing further until after the operation.

PREPARATION OF THE PATIENT FOR ABDOMINAL OPERATIONS

Pre-operative rest in bed.—It would benefit many patients, especially of the hospital class, to be kept in bed for a week before the operation, so that the nervous and vascular systems may be quieted by the enforced rest. In the majority of cases, the patient should go to bed at 6 o'clock in the evening of the day preceding the operation.

Shaving.—The nurse's duties in this respect are the same as are set out for operations on the vagina, except that the entire vulva should be shaved.

Cases of extreme emergency occur in which the patient has to be carried straight on to the operating table without any previous preparation. In such it is a mistake hurriedly to shave her on the table, for loose hairs are apt to be left which constitute a far greater danger than that which the shaving seeks to remove. Instead, the whole hair field should be soaked with whatever antiseptic is used to sterilize the skin.

Bath.—In individual instances, on account of the serious condition of the patient, a bath may not be possible, in which case the surgeon will direct the nurse to wash her in bed.

Local antisepsis.—Having returned from her bath, the patient is put to bed and her nightdress rolled up to her chest, the bedclothes covering her having been previously removed, with the exception of a blanket, which is turned below the pubes. On account of the exposure that will be necessary to carry out the following directions, all windows and doors should be closed and the temperature of the room should not fall below 65° F. Sterilized towels having been placed under the patient, and over her chest and legs, to cover the nightgown and blanket respectively, the abdomen, pubes, and flanks are again washed with soap and water, particular attention being devoted to the umbilicus, especially in stout patients, in whom this depression may have to be cleansed with wool held in dressing forceps. All soap having been removed by swabs of absorbent wool, the skin should be very thoroughly dried.

The best preparation for sterilizing the skin is Violet-green (*see* p. 30). The method is as follows: The skin is first thoroughly painted with the solution, after which a piece of lint cut to cover the whole operation area is soaked in it and laid on. This is covered with a piece of waterproof batiste of slightly larger size, and the whole is held in place with a many-tailed binder. This compress is put on not less than six hours before the operation, and is not removed until the patient is in position on the operating table. Absolute sterility of the skin is effected with an entire absence of irritant effect.

A similar solution, but with colourless flavine instead of the two dyes of Violet-green, is also excellent (*see* p. 32).

The commonly used iodine method of preparation is far inferior in certainty of sterilization, because, owing to the irritant properties of iodine, the antiseptic cannot be employed sufficiently long to kill all the bacteria in the skin. The technique is as follows: a 2-per-cent. solution in rectified spirit is painted over the abdomen 2 or 3 hours before the operation, and this painting is repeated when the patient is in position on the operating table. This solution should never be made up with methylated spirit, as this is most irritating to the eyes of the operator. The skin must be perfectly dry, or the iodine will not penetrate deeply.

Swabbing the skin with alcohol achieves the same result as iodine but because it is colourless the surgeon cannot see whether the area has been completely covered.

Bowels.—The bowels are treated as described for vaginal operations (p. 77).

Bladder. In abdominal pelvic surgery it is of the utmost importance that the patient's bladder should be empty, and the only way of ensuring this with certainty is to pass a catheter on the operating table. The patient's legs should be held up by a nurse on either side, and the catheter, after its top has been dipped into Violet-green or iodine, is passed straight into the bladder, without any other preparation of the parts. Many surgeons do not do this but direct the nurse to pass the catheter immediately before the patient comes into the operating theatre, or rely on the patient passing water herself. Either of these two practices will result, sooner or later, in the surgeon wounding the bladder when making the abdominal incision, or incurring the annoyance of having to desist from the operation after he has opened the abdomen while the nurse empties the bladder with the catheter.

Dress and food.—As for vaginal operations (p. 78).

II. PREPARATION OF THE STAFF AND PATIENT AT THE OPERATION

The surgeon and assistants.—Having put on their operating suits and theatre-boots, the surgeons and assistants prepare their hands and arms. These should be thoroughly washed with soap under warm running water, and then dried with a sterilized towel. The masks are then put on and the hands and arms rewashed. A general nurse then takes the sterilized overalls from the drum and puts them on the surgeon and assistants. The surgeon and his assistants then put on their sterilized india-rubber gloves. It will be noted that we have not made any reference to the use of antiseptics up to this stage of the preparation, for we believe that their use roughens the skin and renders the hands more liable to infection (*see* p. 32). After the gloves are put on, however, the hands are with advantage soaked in a strong antiseptic, such as 1-in-500 biniodide of mercury. During the operation also the hands should be repeatedly dipped in the antiseptic.

The nurses.—The ward sister and theatre sister should wear sterilized overalls, theatre-boots, masks, and india-rubber gloves, and should prepare their hands and arms in the same way. The general nurses should also wear sterilized overalls, theatre-boots, masks and gloves, and should wash their hands with the same initial care, and as often afterwards as occasion may demand, but without removing their rubber gloves. From the nature of their duties they cannot keep their hands absolutely aseptic.

The patient.—For vaginal operations the patient, having been anæsthetized, is placed in the lithotomy position and the vagina is swabbed out with dry pieces of gauze and the antiseptic solution (Violet-green or iodine 2 per cent.) is applied by swabs mounted on holders. The vulva and the skin adjoining are then thoroughly painted and the catheter passed. Sterilized leggings are now fastened on the patient and a sterilized sheet with an oval aperture in the centre, 6 inches by 4 inches, is draped over the abdomen and buttocks and fixed with towel clips, so that the operation site is alone exposed.

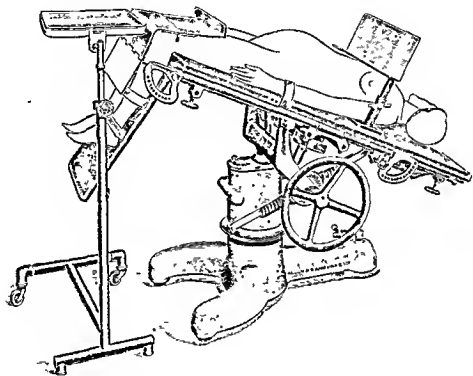


Fig. 47.—Arrangement of the tables for an Abdominal operation.

Abdominal operations.—The patient, having been anæsthetized, is placed on the operation table and the catheter passed, first dipping its end in Violet-green or iodine solution. The lower leaf of the table having been dropped at right angles, her legs are securely fixed to it and the table is then tilted into the Trendelenburg position. (See p. 911.)

Her nightdress is then drawn up round the waist, her arms are secured to her side by the arm-grip shown in Fig. 41, and the anæsthetist's screen (Fig. 42) is placed in position.

A blanket is then laid across her legs so that the edge nearest the patient's head reaches a little below the vulva, and upon the blanket

is placed the knee-table shown in Fig. 40. The general nurse then adjusts the instrument table with a swing arm so that it is on a level with and forms an extension of the surface of the knee-table, after which she proceeds to remove the binder and compress from the abdomen. If Violet-green has been used, no further application to the abdominal skin is required, but with iodine or alcohol a final paint over is necessary. This should be done by the second assistant, or if there be but one, then by the first assistant.

The two assistants, or the ward or theatre sister and the first assistant, now take from the drum the sterilized operation sheet and spread it out so that it covers the operation area, the anæsthetist's screen, the knee-table and elbow-table, and adjust it so that the slit in it exposes the line of the proposed incision.

It is fixed in this position by four towel clips, one above, one below, and one on either side.

By this arrangement a sterile instrument bench is formed, on which all the instruments can be placed convenient to the surgeon's hand without his having to turn away from the work upon which he is engaged (see Fig. 47).

When total hysterectomy or Cesarean section is (or may have) to be performed, the vagina of the patient, after she is anæsthetized and before she is fixed in the Trendelenburg position, should be swabbed out with Violet-green. If Wertheim's operation is to be performed, the vagina must be packed with gauze soaked in half-strength Violet-green (see P 374).

III. THE ANÆSTHETIC

Ether, ushered in by one of the drugs of the pentothal type, or nitrous oxide, or ethyl chloride, is the most generally used of all anæsthetics. On the other hand, its use is more likely to be followed by sickness than any other anæsthetic, and it is an irritant to the respiratory tract. For these reasons the modern anæsthetist keeps the amount used as small as possible, and is the more able to do this since the introduction of curare to produce relaxation.

Since ether is a powerful stimulant, it is specially useful where the patient's heart is feeble, and used in conjunction with spinal anæsthesia, it markedly prevents the fall of blood pressure which the spinal injection produces.

Chloroform is an admirable anæsthetic but its use is accompanied by more danger than ether unless administered by one accustomed to it. It is far less irritating to the respiratory passages than ether and does not provoke turgescence of the blood-vessels or violent respiratory movements of the abdomen. The race of expert chloroformists is unfortunately dying out. Chloroform is a dangerous anæsthetic in all

conditions in which the hepatic or renal cells are damaged, such as acute and chronic septic states, pregnancy-toxæmia, and so forth.

Gas and oxygen by themselves do not give sufficient muscular relaxation for the more difficult gynæcological operations, but combined with pentothal and curare this drawback is much lessened. The addition of ether has the same effect, but then its principal advantage—rapid recovery and absence of vomiting—is largely lost. Gas and oxygen by themselves, by reason of the cyanosis they sometimes cause, increase the amount of bleeding during the operation, sometimes to a marked degree.

Ethyl chloride is admirable for rapid induction, but not for prolonged administration. It is usefully employed for short and simple procedures like opening an abscess.

Trilene and cyclopropane. These two modern anæsthetics are got rid of from the body much quicker than ether or chloroform, and hence their toxic effects are much less. They are used generally in conjunction with Pentothal and gas and oxygen. Ether and cyclopropane form an explosive mixture.

Curare. This powerful drug has lately been much used to produce muscular relaxation when the anæsthetic being used has little or no effect in that direction. By its use, the amount of ether administered, if given at all, can be greatly diminished. An overdose produces respiratory failure and should be treated by prostigmine and atropin.

Spinal anæsthesia by itself is not, in our experience, generally satisfactory for gynæcological work for, though the patients do not suffer any pain, they feel, most unpleasantly, any traction on the pelvic organs and mesenteries and the *morale* of many breaks down under the psychological strain, or they begin to vomit, and a general anæsthetic has in the end to be administered. Moreover, the fact that the patient is conscious is an embarrassment to the surgeon and his assistants, who have continually to be on their guard lest a chance remark should frighten her. An anæsthetist cannot be dispensed with during the operation either, for, as his intervention may be required at any moment, it is necessary for him to keep a constant watch on the patient. A further drawback to spinal anæsthesia used by itself is the distress occasioned while the needle is being passed into the spinal canal. On the other hand, spinal anæsthesia combined with general inhalation anæsthesia is of the utmost value in operations likely to be attended by operative shock, such as Wertheim's operation or abdomino-vaginal or abdomino-perineal excision of the rectum, and can be used as a routine in such. The spinal anæsthesia, which is employed solely for the purpose of blocking shock impulses, is combined with full ether anæsthesia in order to combat the fall in blood-pressure which the spinal injection produces. In our opinion nothing is more dangerous than spinal anæsthesia combined

with very light inhalation anæsthesia, and such fatalities as we have experienced in connexion with spinal anæsthesia have all been in cases in which this was practised, whereas in close on 1,000 Wertheim operations in which the late Herbert Charles, anæsthetizing for us, combined spinal anæsthesia with full ether anæsthesia, not a single death due to the anæsthesia occurred. Spinal anæsthesia produces more complete relaxation of the abdominal wall than any other kind of anæsthesia, and moreover it causes the intestines to contract so that they take up less room (*see* p. 860). It should not be employed in patients whose blood-pressure is very low unless absolutely necessary, nor in acute or subacute septic states. On the other hand, there are cases in which no kind of inhalation anæsthesia is permissible: as, for instance, chronic bronchitis or recent recovery from a detached retina. In such cases spinal anæsthesia is very valuable.

Its greatest drawback is the distressing headache from which about one in six patients suffers afterwards. The headache lasts for a week to ten days and we know of no drug which gives certain relief. Its frequency is, however, reduced if the patients are kept in the Trendelenburg position on the stretchers which remove them to the ward, and if the beds are kept tilted by blocks for 24 hours.

Intravenous anæsthesia. Pentothal, Evipan and similar compositions are much used for induction prior to the administration of ether, gas and oxygen, and so on, and given by continuous intravenous infusion or by repeated doses can effect prolonged anæsthesia. This method of using it is contra-indicated in all toxic and septic states, and in asthmatics, and the anæsthetist should be experienced. The patient may remain unconscious for several hours. As it is not without some danger, this method of administration is less used than formerly.

Basal narcosis.—Morphia as a preliminary to general or spinal anæsthesia, either by itself or combined with hyoscine, is very commonly employed, atropine being usually added to stop oral and bronchial secretion.

Of recent years a large number of new basal narcotics have come into use, all of which belong to the 'barbiturate group.' They produce, in most persons, a degree of narcosis profound enough to convert into a period of oblivion the otherwise trying period that intervenes between leaving the bedroom and taking the anæsthetic. The narcosis commonly lasts for some time (sometimes several hours) after the effects of the anæsthetic have worn off, and there is usually complete and lasting forgetfulness of the whole period. These effects are very merciful, especially to nervous and apprehensive patients.

These basal narcotics can be administered by the mouth (nembutal), by the rectum (avertin, evipan), or by the blood (pentothal, sodium evipan) and are being more and more extensively used. It was shown by Willcox that all the barbiturates, if given in sufficient quantity, act

very destructively on the parenchyma of the liver and kidney and the cerebro-spinal system, and for this reason they should not be employed in cases in which those organs are known to be defective, or are suspected of being so. In particular they are dangerous in all profound toxic states, especially if the toxæmia has been existent for some time. There is reason to believe that morphia and its derivatives delay the excretion of the barbiturates, and we think that they should not be combined, or, if it is desired to give morphia after the operation, it should not be administered until the effects of the barbiturate have been recovered from. The barbiturates and also avertin sometimes produce violent excitement as their effects wear off, and also in certain persons a degree of toxic shock with coldness and a slow feeble pulse (*see p. 916*).

Infiltration anæsthesia has little scope in gynæcological surgery. Many years ago we gave deep infiltration anæsthesia a prolonged trial in abdomino-pelvic operations, but abandoned it in favour of spinal anæsthesia, which effects a much more complete blocking of shock impulses. The vagina and vulva are parts unsuitable for infiltration owing to the impossibility of sterilizing them. Practically the only conditions under which we employ it is jejunostomy or cæcostomy for post-operative obstruction when the patient is too ill to take a general anæsthetic.

CHAPTER VI
OPERATIONS ON THE VULVA
URETHRAL CARUNCLE

Preparation of the patient.—See p. 76.

Instruments.—Auvard's self-retaining speculum, a urethral dilator, catheter, bladder-sound, Paquelin's or other cautery, a pair of fine rat-toothed forceps, scissors or scalpel, and catgut No. 0.

There are three different methods by which a urethral caruncle can be treated :

1. Cauterization.
2. Excision and cauterization.
3. Excision and suture.

Cauterization.—A small three-bladed urethral dilator, or the point of a small bladder-sound (if that alone is available), is inserted into the urethral orifice and pressed against the anterior urethral wall. This will prevent the cautery from burning the anterior wall and so obviate stricture. The operator, or assistant, then separates the labia majora and the caruncle is very thoroughly destroyed with the point of the cautery, which should be heated to a dull-red colour only. Finally vaseline is smeared over the area of operation (Fig. 48).

Dangers.—If the cauterization is too severe, a stricture at the orifice of the urethra may result.

Excision and cauterization or suture.—The orifice of the urethra is dilated as before, and the caruncle is then seized with fine forceps and either dissected off the posterior urethral wall with the scalpel or snipped off with a fine pair of scissors, the excision being carried somewhat wide of the growth so as to include a small piece of healthy mucous membrane (Fig. 49). The rather free bleeding is then stopped, either by cauterization or by passing a fine suture from one cut edge of the mucous membrane through the underlying muscle to the other cut edge and tying it.

Dressing and after-treatment.—See Chapter xxx. Some patients after this slight operation have retention of urine. This may last for one or two days. It can be relieved by the usual methods, and is c

no serious importance. The patient may be allowed to get up the next day.

Recurrence.—Urethral caruncles have a marked tendency to recur, and in some cases more than one operation is necessary to cure this condition. Therefore, although the operation is a simple one, it behoves the operator to perform it very thoroughly, in order, if possible, to obviate recurrence. In addition, it is desirable that the patient should be informed of this tendency to recurrence, lest on its taking place she should suspect the operator of being unskillful. It is wise to examine the removed caruncle microscopically.

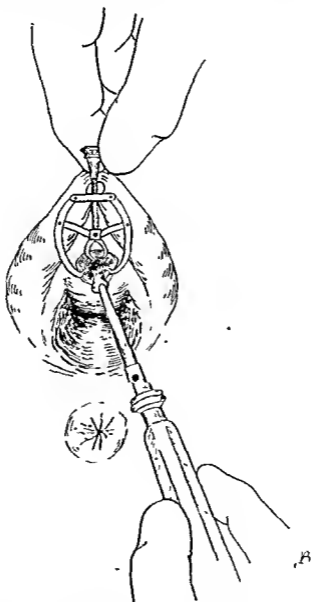


Fig. 48.—Cauterization of a urethral caruncle.

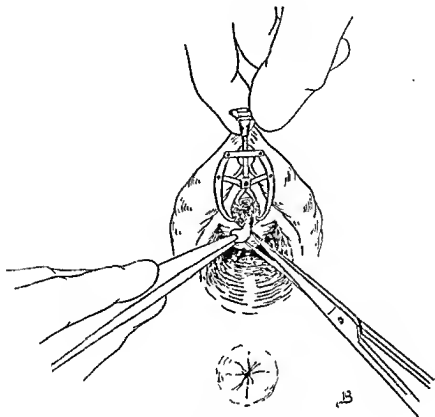


Fig. 49.—Excision of a urethral caruncle.

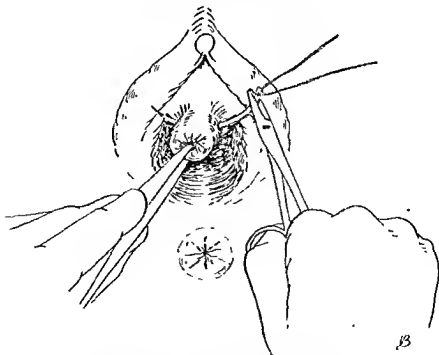


Fig. 50.—Transfixion of prolapsed urethra.

PROLAPSE OF THE URETHRA

Preparation of the patient.—See p 76.

Instruments.—Dissecting forceps, two pairs of pressure forceps, catheter, two curved needles No. 13, scissors, and catgut No. 0.

Operation.—That portion of the urethra which is prolapsed is seized with the dissecting forceps and drawn forwards so as to put it on the stretch. A suture is then passed across the urethral canal, in its passage transfixing the prolapsed mucous membrane (Fig. 50). The mucous membrane in front of the suture having been removed

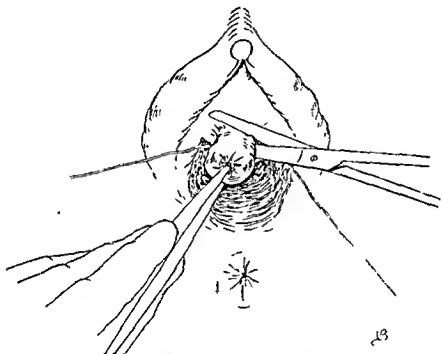


Fig. 51.—Removal of prolapsed urethra.

with scissors (Fig. 51), that portion of the suture which can be seen traversing the urethral canal is pulled down out of the canal and divided so that two sutures are now available (Fig. 52), one to anchor the cut mucous membrane to the orifice on the left side and the other for the same purpose on the right side. These sutures having been tied, the cut edge of mucous membrane is sutured to the urethral orifice with as many interrupted sutures as may be found necessary (Fig. 53).

Complications.—This operation may result in a slight stricture at the urethral orifice if the operator has improperly cut away part of the mucous membrane of the vestibule instead of limiting the excision to that of the urethra.

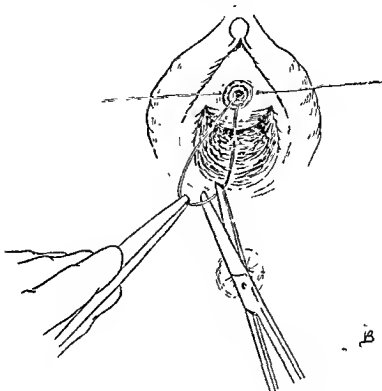


Fig. 52.—Fixation of the mucous membrane.

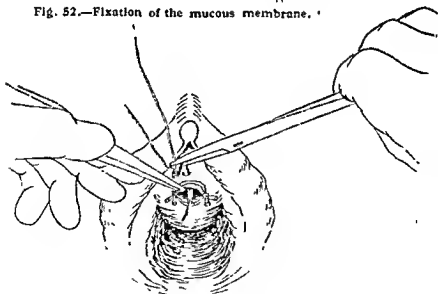


Fig. 53.—Suturing the mucous membrane.

Dressing and after-treatment.—See Chapter xxx. It is usual to allow the patient to get up at the end of a week.

SUB-URETHRAL ABSCESS

Preparation of the patient.—See p. 76.

Instruments.—Auvard's self-retaining speculum, scalpel, dissecting forceps, two pairs of pressure forceps, catheter.

Operation.—The abscess is incised, the pus evacuated, and the cavity thoroughly swabbed with 1-in-1,000 flavine.

Dressing and after-treatment.—The cavity is packed with flavine gauze. The general lines of after-treatment are described in Chapter xxx. The gauze is removed the day following the operation, after which the cavity is irrigated with 1-in-1,000 flavine until healing by granulation has taken place. The patient is able to get up as soon as the purulent discharge ceases.

HYDROSTATIC DILATATION OF THE BLADDER

In certain cases of nocturnal incontinence in young women or children, after the various methods of treatment by drugs have been tried and failed, a cure or, at any rate, great improvement may be obtained by the hydrostatic dilatation of the bladder.

Preparation of the patient.—See p. 76.

Instruments.—A catheter attached to a glass funnel by 4 feet of rubber tubing.

Operation.—The bladder having been emptied of urine, warm boric lotion is gradually run into it from the funnel. The pressure must be regulated so that the bladder is not distended too forcibly, and this is effected by holding the funnel containing the lotion about 4 feet above the level of the patient and, as the lotion runs, noticing the position of the bladder *per abdomen* from time to time. About 2 pints of the boric lotion is run into the bladder and allowed to remain there for 20 minutes, and then withdrawn.

After-treatment.—The patient may get up the next day.

INCREASING THE LENGTH OF THE URETHRA

This operation was devised by one of us (V.B.) for certain cases of diffuse carunculosis of the urethra, especially those in which partial amputation of the urethra has been performed without success. In such cases the orifice of the urethra presents as a ring of very sensitive caruncular tissue, which occasions the patient continual pain and discomfort. The object of this operation is to cover in the painful tissue.

Preparation of the patient.—See p. 76.

Instruments.—Those listed on p. 514 and a bladder-sound.

Operation. i. Demarcating the flaps.—The anterior vaginal wall

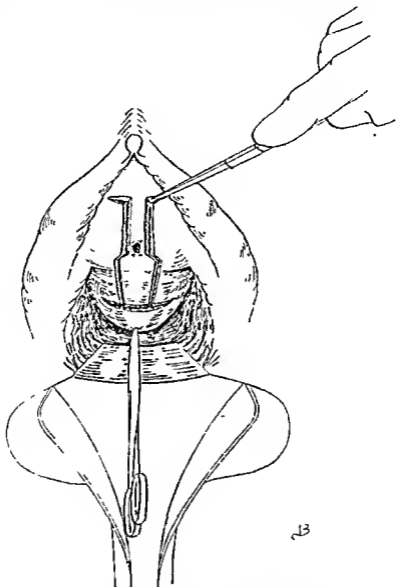


Fig. 54.—Increasing the length of the urethra: demarcating the flaps.

having been pulled down as far as possible, by means of a pair of forceps, the flaps to be raised are demarcated by the incisions shown in Fig. 54.

It should be noted that the lines demarcating the flap taken off the anterior vaginal wall make it broadest at its base. The flap must be relatively broad or it will necrose.

ii. Reflecting the lateral flaps.—A flap on either side of the urethra is reflected, consisting of the mucous membrane of the vestibule and partly of the anterior vaginal wall.

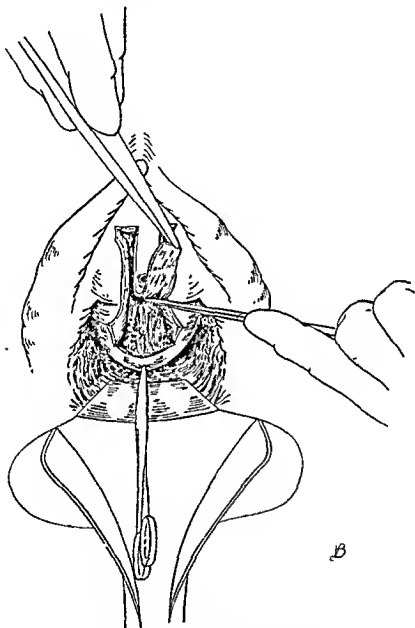


Fig. 55.—Reflecting the median flap.

iii. Reflecting the middle flap.—Starting on the anterior vaginal wall, a central flap of mucous membrane is now dissected downwards as far as the urethral orifice (Fig. 55). This flap must be broader than it is long, otherwise it will necrose.

iv. Extending the urethra forwards.—A No. 10 rubber catheter having been passed into the bladder, the middle flap is turned over

and its free end is sutured on either side of the catheter to the raw surfaces which lie on either side of the central strip of undisturbed vestibular mucous membrane (Fig. 56). By this device the length of the urethral canal is increased by the addition of a new segment lined

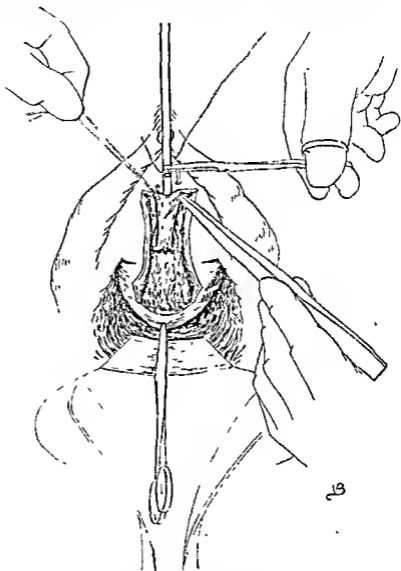


Fig. 56.—Suture of the median flap.

both on its front and back walls with squamous epithelium and the orifice of which is situated just under the clitoris.

v. Covering in the raw surfaces.—The raw surfaces are now covered in by the suturing together, in the middle line, of the two lateral flaps. Interrupted catgut sutures should be used and the more anterior one

EXCISION OF A BARTHOLIN'S CYST

Preparation of the patient.—See p. 76.

Instruments.—A catheter, scalpel, six pairs of pressure forceps, scissors, dissecting forceps, two Bonney's half-circle needles No. 9, Reverdin's needle, and catgut sutures No. 2.

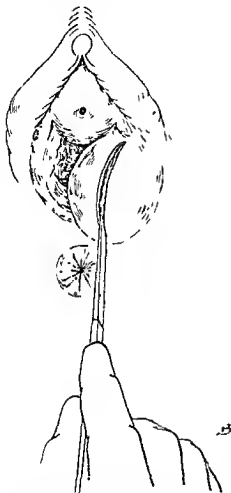


Fig. 58.—Excision of a Bartholin's cyst :
Incising the mucous membrane.

Operation. i. Incision over the cyst.—An incision running parallel with the long axis of the labium majus down to the cyst-wall is made with the scalpel (Fig. 58). This incision should be at the junction of the skin with the vulval surface, so that the resulting scar may not cause dyspareunia.

ii. Separation of the cyst-wall.—A pair of pressure forceps is then applied to the cut edge of the incision and the cyst-wall is separated from the surrounding connective tissue with the handle of the scalpel (Fig. 59). It will be found to separate quite easily in all directions, unless it has been the seat of inflammation, till its upper and posterior surface is reached. This part will not separate easily, and generally the enucleation has to be finished by cutting with the scalpel through the firm strands of connective tissue in this situation (Fig. 60). It is at this more adherent part that the

branches of the pudic arteries and veins are found, and these will require ligaturing.

When enucleating the cyst, care must be taken not to button-hole the vaginal aspect of the labium.

iii. Suturing the venous plexus in the bed of the cyst.—Apart from any arterial bleeding, it is sometimes difficult to control oozing from the venous plexus in the bed of the cyst. Since this bed is sometimes rather

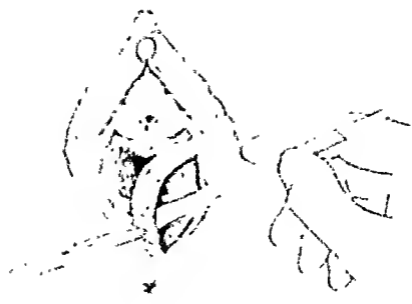


FIG. 59.—Separating the capsule.

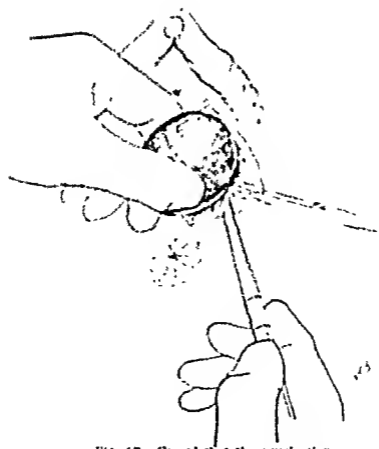


FIG. 60.—Completing the enucleation.

large and, if not obliterated, would form a pocket in which blood could accumulate, it is best to bring its surfaces together by interrupted catgut sutures applied inside the cavity, commencing at the bottom and gradually obliterating it (Fig. 61).

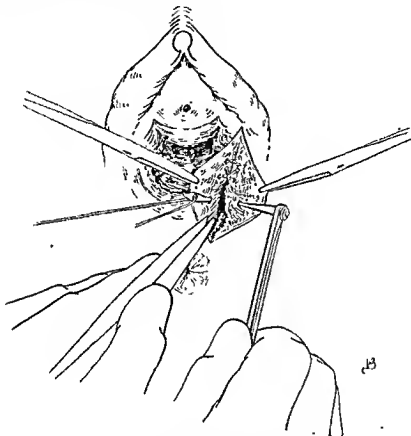


Fig. 61.—Obliterating the enucleation cavity.

iv. **Suturing the cut edges of the incision.**—Lastly, the cut edges are approximated with a continuous suture (Fig. 62).

Difficulties.—Difficulty may be experienced in enucleating the cyst if it has been inflamed and the wall is consequently adherent to the surrounding structures or if, during its enucleation, the cyst is punctured. When, owing to inflammatory adhesions, a plane of cleavage does not exist, the cyst should be incised, its contents evacuated and the index finger of the left hand passed into the cyst cavity. Thus guided, the cyst-wall should be excised with scissors, kept as close to the former as possible.

Dangers. Bleeding.—Rarely, owing to a ligature having slipped, secondary hæmorrhage may take place to a serious extent, forming a large hæmatoma. If this occurs, and pressure with a firm pad of

cotton-wool and T-bandage does not arrest the hæmorrhage, the patient will have to be anæsthetized, the sutures removed, and the bleeding-point secured.

Sepsis.—If the cyst is suppurating and is punctured during its enucleation, the pus will soil the seat of operation, and this part will,

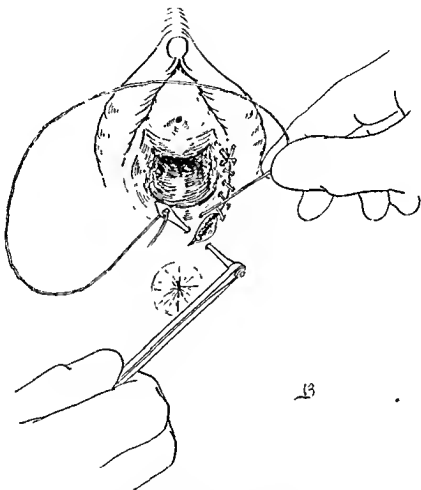


Fig. 62.—Closure of the wound.

therefore, have to be most carefully cleaned by swabbing it with Violet-green or 1-in-100 flavine solution. The cavity should, in such cases, be drained for a few days with an india-rubber tube.

Care of the operator's eyes.—When opening a Bartholin's abscess or suppurating cyst the operator should take care not to make pressure on it, for if he does, the pus may spurt into his eyes and, if the infection be gonococcal, cause severe conjunctivitis.

Dressing and after-treatment.—See Chapter XXX. The patient requires to be kept in bed for about 10 days.

ABSCESS OF BARTHOLIN'S GLAND

Preparation of the patient.—See p. 76.

Instruments.—A catheter, scalpel, and two pairs of pressure forceps.

Operation.—The abscess is opened by an incision parallel with the long axis of the labium majus. The pus having been evacuated, the abscess cavity is well washed out with a 1-in-1,000 flavine solution and then packed with gauze soaked in flavine. The surgeon should be careful when incising the abscess not to get a spurt of pus in his eyes.

Dressing and after-treatment.—The general lines of after-treatment will be found discussed in Chapter xxx. The gauze should be removed next morning, and the cavity repacked twice daily after douching. When there is much œdema or swelling of the labium majus, hot fomentations may be applied to it for some days until these subside.

The length of time before the patient may get up must depend on how long the cavity takes to granulate.

HYDROCELE OF THE CANAL OF NUCK

Preparation of the patient.—See p. 76.

Position of the patient.—Lying flat on the table.

Instruments.—Scalpel, scissors, dissecting forceps, four pairs of pressure forceps, four curved needles No. 7, catgut sutures No. 1, Michel's clips, Reverdin's needle.

Operation.—An incision is made through the skin over and parallel with the long diameter of the swelling, care being taken to avoid wounding the wall of the sac. The sac, having been exposed and opened, and its contents evacuated, is dissected out and its neck of communication with the peritoneum, if it exists, is ligatured. If the internal abdominal ring seems unduly large, it should be closed with one or two interrupted sutures passed through the arching border of the transversalis and the internal oblique muscles and Poupart's ligament respectively. The external abdominal ring is closed with a couple of sutures. Any bleeding having been stopped with ligatures or pressure forceps, the skin incision is closed with a few Michel's clips.

Dressing.—This consists of gauze, wool, and a spica bandage.

After-treatment.—See Chapter xxx. The clips will be removed at the end of 4 days, and the patient can get up in 10 days.

VARICOSE VEINS OF THE VULVA

As a result of pregnancy, and even apart from it, the veins of the vulva may become varicose. In some pregnant patients so bad is

the condition that delivery has to be by Cæsarean section to avoid rupture of the veins or obstruction from the formation of a hæmatoma during labour. Varicose veins of the vulva must not be excised during pregnancy.

Preparation of the patient.—See p. 76.

Instruments.—Scalpel, dissecting forceps, scissors, six pairs of pressure forceps, Reverdin's needle, silkworm or nylon gut, catgut No. 0, four curved needles No. 7, Michel's clips and an aneurysm-needle.

Operation.—The labium of the affected side must be stretched so that the skin-incision over the dilated veins may be accurately made. This can be done by an assistant pulling on the upper end of the labium while the operator pulls on the lower end; or the operator may stretch the labium between the thumb and index-finger of his left hand. An incision is then made through the skin down to the varicose veins. The skin-edges being held apart, the veins are dissected from their bed with the handle of the scalpel and dissecting forceps. The veins, having been well freed, are ligatured with catgut passed on the aneurysm-needle as far apart as possible at the upper and lower angles of the wound, after which the portion between the ligatures is excised. Any bleeding having been arrested, the skin incision is closed with a few interrupted sutures of silkworm or nylon gut, or by Michel's clips.

Dressing and after-treatment.—See Chapter xxx. The patient may get up at the end of 10 days, the stitches having been removed after a week.

HÆMATOMA OF THE VULVA

If the effused blood is not absorbed with the usual treatment by cold compresses, or if it appears likely to suppurate, then the clot should be turned out.

Preparation of the patient.—See p. 76.

Instruments.—Scalpel, dissecting forceps, four pairs of pressure forceps, Reverdin's needle, four curved needles No. 7; catgut No. 1.

Operation.—An incision is made over the swelling through the skin down to the effused blood. The blood-clot is turned out—after which the cavity is swabbed out with flavine, 1 in 1,000. Any bleeding-points having been ligatured with catgut, the edges of the incision are brought together with interrupted catgut sutures passed deep to the cavity so that the latter is obliterated when the sutures are tied.

If suppuration has taken place, the operation is performed in a similar way, but in this case the cavity is packed with flavine gauze and the wound allowed to granulate up.

Dressing and after-treatment.—See Chapter xxx. If suppuration has not occurred, the patient can get up in 10 days, the skin sutures having been removed in a week; otherwise she must rest till granulation is complete.

WARTS OF THE VULVA

If the usual local treatment does not cure the warts, or if they are too large to be treated in this way, then they should be removed. The bleeding may be very smart, especially if they are removed in pregnancy.

Preparation of the patient.—See p 76.

Instruments.—Scissors curved on the flat, dissecting forceps, six pairs of pressure forceps, four curved needles No. 7, catgut No. 0.

Operation.—The warts should be removed with the scissors, after which the raw surfaces are closed with mattress-sutures.

Dressing and after-treatment.—See Chapter xxx. The sutures are removed in 7 days, and the patient gets up 3 days later.

EXCISION OF PART OR WHOLE OF THE VULVA

Indications.—The vulva may be removed wholly or in part for leucoplakic vulvitis,* tubercle, or hypertrophy of the clitoris or the labia due to elephantiasis or syphilis. Cancer of the vulva is not properly treated by simple excision (see p. 109).

Preparation of the patient.—See p. 76.

Instruments.—Bladder-sound, scalpel, twelve pairs of pressure forceps, dissecting forceps, scissors, Reverdin's needle, three curved needles Nos 1 and 7, silkworm or nylon gut, catgut Nos. 1 and 0, Michel's clips, and rubber catheter No 12

Operation for complete excision.—An oval incision is made with the scalpel through the skin and subcutaneous tissue down to the deep fascia and well clear of the disease. The incision commences above the clitoris on each side, includes, if necessary, both labia majora, and ends posteriorly at the fourchette. A second incision is now made round the urinary meatus, including the vestibule and the vaginal orifice. An incision is then made in the median line at the fourchette, the outer and inner oval incisions being thus joined (Fig. 63).

* Berkeley and Bonney. "Leucoplakic Vulvitis and its Relation to Carcinoma," *Trans. Roy. Soc. of Med.*, Nov. 11, 1909. Victor Bonney, *Archives of Middlesex Hospital*, 1907, and *Hunterian Lectures, R.C.S.*, 1908.

The tissue on one side of this median incision is now clamped with the pressure forceps and, as it is pulled up, the structures lying between the inner and outer incisions down to the deep fascia are then dissected away in a single piece, as high as the level of the urethra. The same

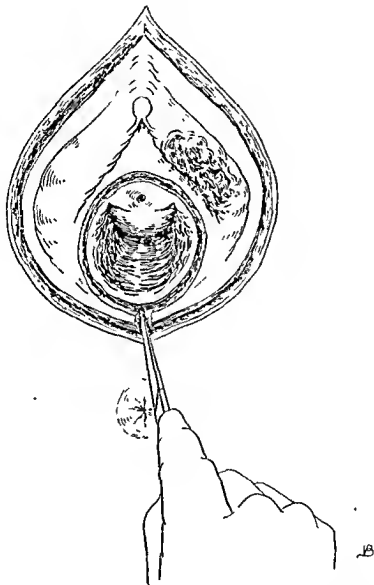


Fig. 63.—Excision of the vulva: Demarcating the diseased area.

procedure is carried out on the other side. The separated portion on each side is then pulled up by the forceps attached to them and the remaining portion of the vulva is then dissected off the underlying tissues. All spouting vessels are clamped for the time being with

pressure forceps and ligatured after the excision has been completed (Fig. 64).

At times there is very free bleeding, especially from the dorsal artery of the clitoris and some of the large vestibular vessels, and it is

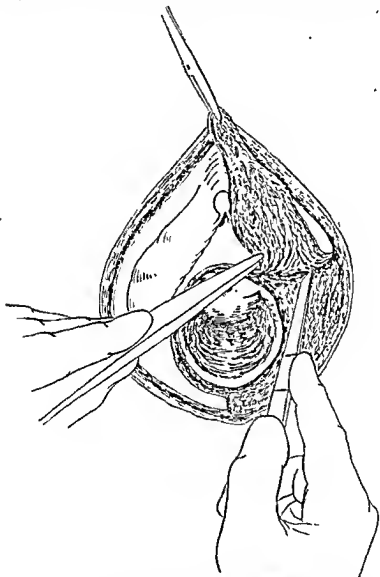


Fig. 64.—Excising the diseased area.

difficult to pick up the bleeding-point, in which case the hæmorrhage can be effectually controlled by passing a mattress-suture under the bleeding area.

The right and left edges of the outer incision above the level of the urethral orifice are now approximated with interrupted silkworm or nylon gut sutures passed deeply to the raw surface. Below this level

the cut edges of the skin and vagina respectively are united with No. 1 catgut sutures (Fig. 65).

If there is any difficulty in approximating the cut edges of the

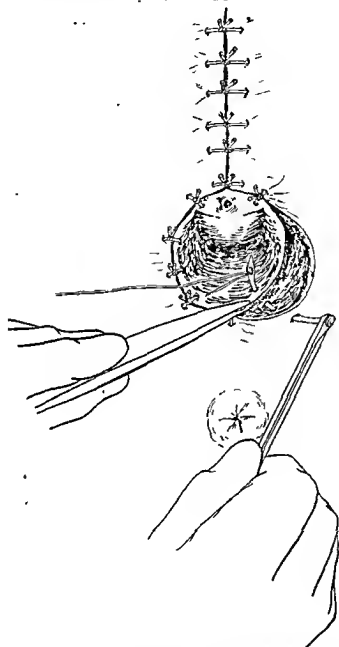


Fig. 65.—Suturing the wound.

skin and vagina, the lower end of the vagina should be freed for about an inch so that it can be pulled down and brought into close apposition with the skin edge, thus covering the raw surface left after the removal of the growth.

Partial excision.—The operation of partial excision is carried out on the same lines, but the area of removal is smaller. The ablation

of greatly hypertrophied nymphæ is associated with extraordinarily free hæmorrhage, and many pressure forceps should be at hand.

Removal of inguinal glands.—In all cases of malignant disease of the vulva the inguinal glands on both sides should be removed at the same time, whether *enlarged or not*.

The removal of the glands is best carried out before the vulva has been excised, the tissue containing the glands being removed *en bloc*

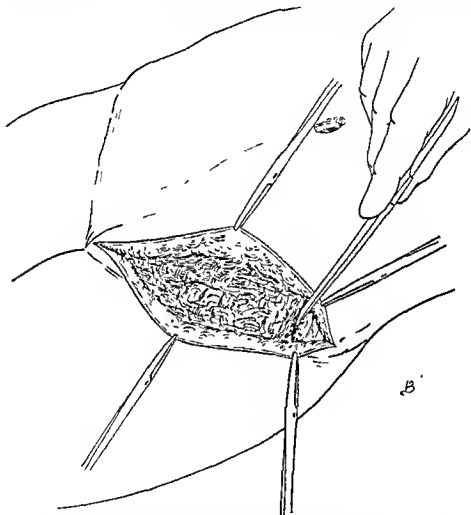


Fig. 66.—Removing the inguinal glands. Exposing the aponeurosis.

with the vulva. The patient is laid flat and, the leg on either side having been extended, an incision should be made running upwards and outwards parallel with Poupart's ligament of one side and extending from just beside the spine of the pubis almost as far as the anterior superior iliac spine. The skin on either side of this incision having been dissected back, the abdominal fascia is exposed at the outer angle of the incision (Fig. 66). The index finger of the left hand is then

inserted superficial to the fascia and deep to the layer of fat which contains the glands, and pushed down the length of the incision, lifting as it does so the glands from off the fascia (Fig. 67). The layer of tissue thus raised is then separated with the scissors from its attachments above and below, and reflected inwards until the saphenous opening is reached (Fig. 68). By means of the finger and the handle of the scalpel, the

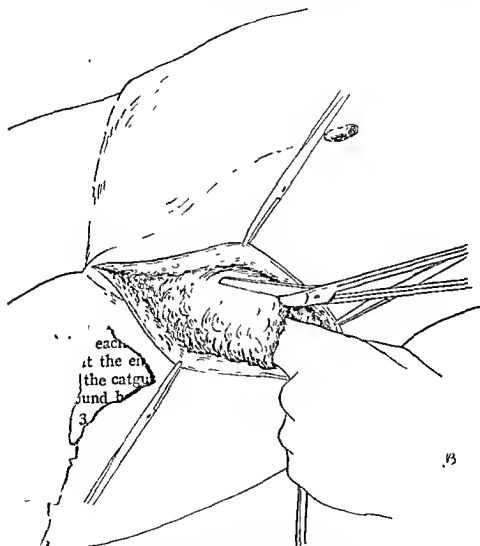


Fig. 67.—Raising the glands off the fascia.

tissue in the saphenous opening is now raised out of it and, the use of the scissors being resumed, the whole mass is reflected inwards to the extreme inner point of the skin incision. All bleeding-points having been secured, a similar procedure is carried out on the opposite side, after which the skin incisions are closed by continuous silk sutures, leaving room for a drainage tube to be inserted at the inner ends.

The patient is now placed in the lithotomy position and the excision

of the vulva is proceeded with in the manner already described, except that the upper end of the outer incision is made to join the inner ends of the groin incisions, so that when the vulva is removed, the detached glands are removed with it. After the vulva has been sutured a narrow drain tube should be inserted into each groin wound.

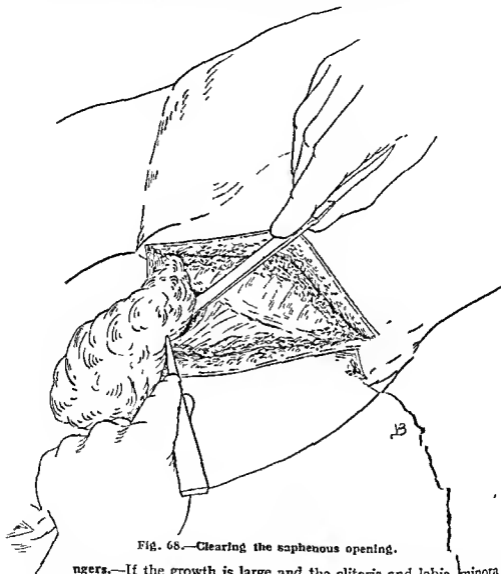


Fig. 68.—Clearing the saphenous opening.

ngers.—If the growth is large and the clitoris and labia minora are affected, there may be some difficulty in dissecting the mass away without injuring the urethra. It will be found safer in these circumstances to pass a bladder-sound into the urethra while the structures in its neighbourhood are being removed.

If the inguinal glands are large and adherent, care must be taken when removing them not to injure the femoral vein in the saphenous

opening. The internal saphenous vein is always divided and, unless promptly secured, will bleed freely. If the femoral vein is injured, a lateral ligature must be placed on it.

Dressing.—It is better in most cases to fix a small rubber catheter in the bladder for 4 or 5 days by means of a catgut suture. If this is not done, and the patient, as very often happens, is unable to pass her water, great difficulty may be experienced in passing a catheter. The vulval wound is covered with dry gauze held in position by a T-bandage. If the inguinal glands have been removed, dry dressings and a spica bandage are applied to each side.

After-treatment.—The general lines of after-treatment will be found in Chapter xxx.

After this operation pain is generally a marked feature, being due to the tension on the stitches; it can be relieved by morphia.

Owing to the situation of the wound and the nature of the disease for which the operation is generally undertaken, there is a liability, even with the greatest care, to a certain amount of suppuration, and at times this is very marked, resulting in high fever with considerable constitutional disturbance. If inflammation supervenes, any sutures causing injurious tension, suppuration, or interference with free drainage are to be removed, and hot fomentations should be applied every 4 hours.

In the more severe cases, with sloughing, the parts should be irrigated with a 10-volume solution of peroxide of hydrogen before the application of each new fomentation. The sutures in the groin may be removed at the end of a week; those closing the vulval wound in 10 days, and the catgut sutures left to absorb.

If the wound heals by first intention the patient may get up in a fortnight to 3 weeks.

THE RADICAL OPERATION FOR CARCINOMA OF THE VULVA

The results of simple excision of the vulva for cancer in that situation have proved to be very poor, and even when combined with excision of the superficial inguinal glands the recurrence rate is high.

Hence have come into being of quite recent years operations designed to effect a much wider excision, and certain enterprising surgeons both here and abroad have been practising these procedures. The technique now to be described is that of Stanley Way, who, in this country, has the most experience in the surgical treatment of cancer of the vulva.*

Way describes five main groups of glands in the lymphatic system of the vulva. (1) The superficial inguinal group, which lie in the line of the inguinal (Poupart's) ligament and slightly below it. (2) The

* The anatomy of the lymphatic drainage of the vulva and its influence on the radical operation for carcinoma. *Annals of the Royal College of Surgeons of England*, Vol. 3, Oct., 1918, pp. 107-209.

deep inguinal group, which lie along the inguinal canal and the course of the round ligament. (3) The superficial femoral group, which lie along the internal saphenous vein, just before it passes into the saphenous opening. (4) The deep femoral group, lying in the saphenous opening, and in the crural canal.

The uppermost of this group is known as Cloquet's gland, and it lies at the top end of the canal underneath the inguinal ligament, and through it most of the lymphatic drainage from the vulva passes. (5) The

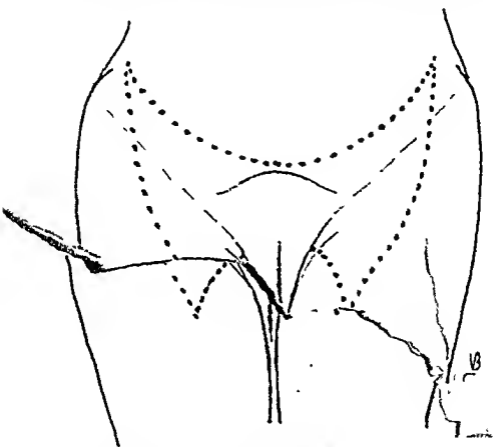


Fig. 69.—Radical excision for carcinoma of the vulva seen from the front.

external iliac group, of which the main chain lies beneath the inner side of the femoral vein, communicates below with Cloquet's gland and the superficial iliac glands. Besides this chain, there are several glands between the external iliac artery and the femoral artery a few glands lie on the Psoas muscle of substantial size. The two latter chains are the lymphatic drainage of the leg, &c.

in carcinoma of the vulva. There are also a few small inconstant glands in the fat of the lower part of the mons.

The lymphatics of the vulva form a very fine network which covers the whole area, and its collecting trunks connect mostly with the superficial inguinal group of glands, those from the hinder part of the vulva bypassing transversely outwards, while those from the upper part ascend to the mons before turning outwards. There is one exception

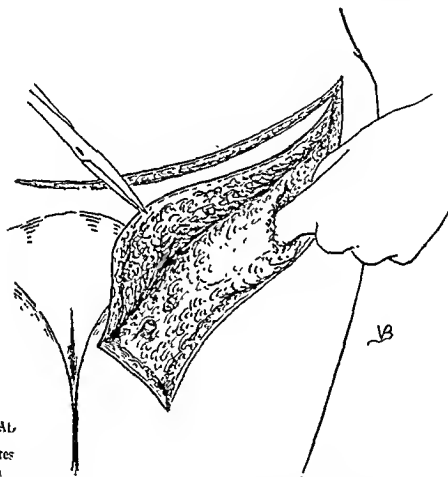


Fig. 70.—Raising the superficial inguinal glands and the internal saphenous vein divided.

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this common route, namely that some of the lymphatics from the toris pass direct into the glands lying on the inner side of the external vein. There is also a very free lymphatic anastomosis in the area of the vulva, which explains why in some cases the involved glands of there on the opposite side to that on which the primary growth is situated. Bearing in mind the foregoing facts, it is obvious that when operating for cancer of the vulva, the excision should be very wide indeed if the chances of recurrence are to be reduced to the minimum.

The operation is still on its trial, but Way has had some notable successes, even in cases so advanced that the glands in the groin were breaking down. A full statistical estimate of its results must be awaited, but whatever the figures, it must be remembered that the cases operated on include many so advanced that before the introduction of this new procedure they would have been deemed inoperable.

Preparation of the patient.—See p. 76.

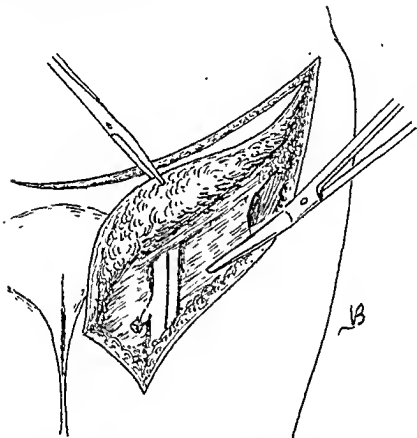


Fig. 71.—Removing the deep fascia outside the vessels.

As the operation is a severe one, glucose-saline and blood administration during and after it are necessary, and the canula should be in the vein before the operation begins (see Chap. xxxi).

Instruments.—Those used for a simple excision of the vulva (see p. 102), but Michel's clips are not required. In addition, a couple of retractors are needed, a flat hernia director, and self-retaining catheter and a diathermy knife and apparatus.

Operation.—i. **The skin incision.**—The patient is placed supine on the table, and starting from just inside the anterior superior spine a

curved incision is made inwards to a point on the upper limit of the mons, and slightly beyond it. This incision will subsequently be carried across to the anterior superior spine on the other side, but this extension should be postponed till the operation on that side is begun.

A further incision, starting from the same point just inside the anterior superior spine, is carried downwards in a curve to a point over the apex of Scarpa's triangle, and from there curved upwards and inwards to end at a point on the thigh, about 2 inches directly below the spine of the pubis. These incisions go down to the abdominal

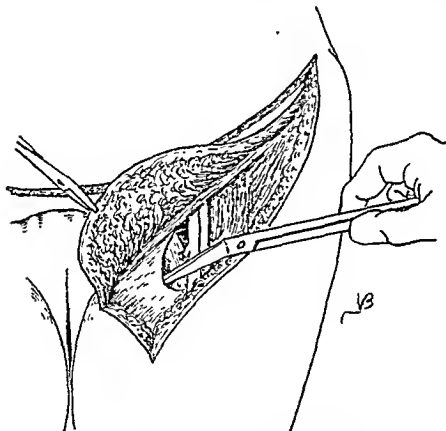


Fig. 72.—Dividing the fascia inside the vessels.

aponurosis and the deep fascia of the thigh. During this step, the internal saphenous vein is exposed, ligatured and divided (Fig. 69).

ii. Removal of the superficial inguinal glands.—By means of the finger introduced through the outer part of the lower incision, the fat and cellular tissue is raised off the fascia covering the thigh muscles, bringing with it the superficial groups of inguinal and femoral glands (Fig. 70). The fat is then divided in the line of the lower incision and a flap turned upwards as far as the inguinal ligament. The femoral vessels are thus exposed, and the internal saphenous vein is religatured close to the femoral vein.

iii. Removing the fascia over the thigh muscles.—Beginning on the outer side, the fascia covering the Sartorius and Psoas muscles is raised and divided along the line of the lower skin incision, and then turned upward (Fig. 71). The fascia covering the Pectineus and inner fibres of the Adductor Magnus muscles is then similarly dealt with (Fig. 72). The femoral vessels and the lower part of the crural canal are thus fully exposed, and the deep inguinal glands are removed.

iv. Freeing the upper part of the flap.—Starting along the line of the upper incision, all the tissues down to the aponeurosis are raised

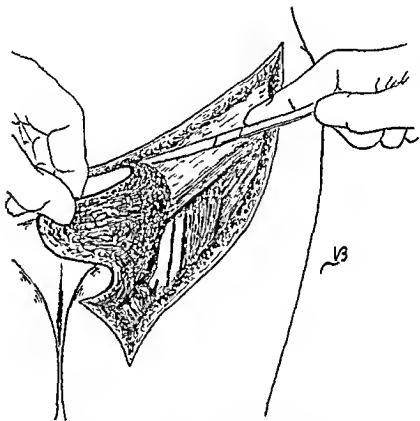


Fig. 73.—Separating the upper part of the flap.

from off it and the separation is continued downwards till it joins the plane of separation already effected from below. A large flap is thus made, and this is hinged inwards fully exposing the aponeurosis, inguinal ligament, the femoral vessels and the muscles of the upper thigh (Fig. 73).

v. Incision of the abdominal aponeurosis and transversalis muscle.—Along a line about one inch above the inguinal ligament an incision is now made, parallel to the ligament which divides the abdominal aponeurosis and the fibres of the transversalis muscle (Fig. 74).

The subperitoneal fat is thus laid bare and on the inner side and beneath it, the peritoneum. At the inner end of the incision the round ligament and the deep epigastric vessels come into view, and both are divided and ligatured. Care must be taken when dividing the round ligament not to open the peritoneal cavity which lies close to it.

By means of the fingers and a retractor, the peritoneum is now

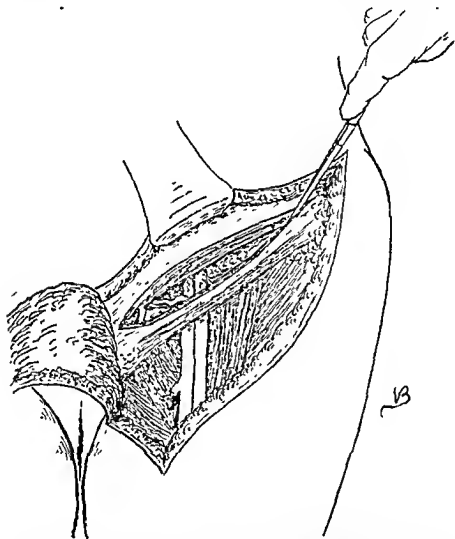


Fig. 74.—Dividing the aponeurosis of the external oblique and the transversalis muscle. Round ligament and deep epigastric vessels exposed.

pushed inwards, uncovering the external iliac vessels and the glands which accompany them (Fig. 75).

vi. Division of the inguinal ligament.—Guided by the finger or a broad flat director pushed up the crural canal, the inguinal ligament is now divided and the whole length of the vessels, from the bifurcation of the common iliac to the apex of Scarpa's triangle, is brought into

view. The deep circumflex iliac artery and vein are tied and divided (Fig. 76).

vii. Removing the external iliac glands.—By means of the finger, aided by scissors, the several chains of external iliac glands are now separated from above downwards. The most important of these chains is that which lies on the inner side of the external iliac vein;

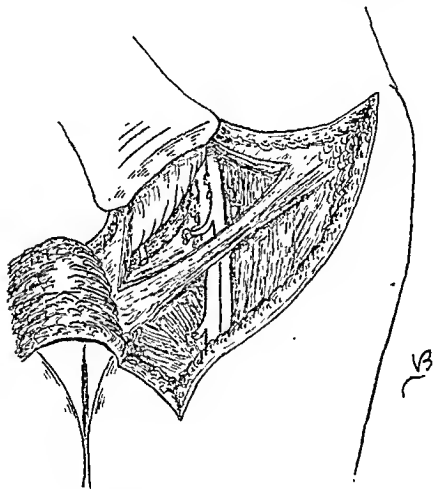


Fig. 75.—Retracting the peritoneum and exposing the external iliac vessels.

and of the glands composing it the lowermost, the gland of Cloquet, must surely be removed (Fig. 77).

By pushing the finger over the brim of the pelvis, the obturator fossa can be cleared. There is a pretty constant vein running from the external iliac vein over the brim of the pelvis down to the obturator fossa, and this should be sought for, ligatured and tied, for it can cause troublesome hæmorrhage.

viii. Suture of the transversalis muscle.—All bleeding points having been secured, the incision in the transversalis is now closed with interrupted catgut sutures.

ix. Suture of the abdominal aponeurosis.—It is not possible to rejoin the divided parts of the inguinal ligament, and it is therefore necessary to take steps to prevent a subsequent hernia of the abdominal wall. This is done in the following manner: the edge of the aponeurosis

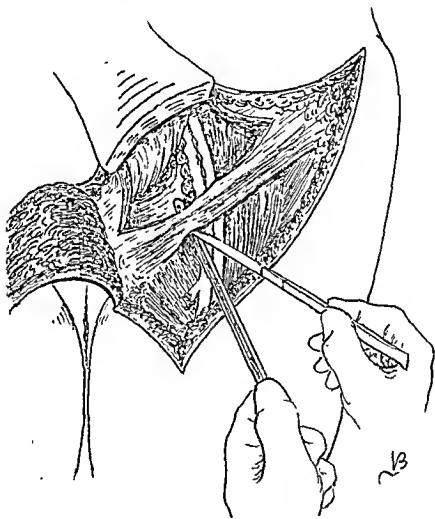


Fig. 76.—Dividing the inguinal (Poupart's) ligament.

outside the line of the femoral vessels is attached by interrupted catgut sutures to the outer part of the inguinal ligament and inside the line of the vessels to the pectineus muscle—each suture, before it penetrates the muscle, picking up the periosteum of the exposed pubic ramus (Fig. 78).

x. Closure of the skin incision.—Interrupted sutures now draw the skin edges together, starting at the outer angle of the exposed area

and continuing to just within the line of the femoral vessels. Beyond this point, however, the skin edges are two widely separated for suture, and this part of the raw area must be left open.

x. Repeating the procedure on the opposite side.—The upper incision first made is now extended to just within the anterior superior

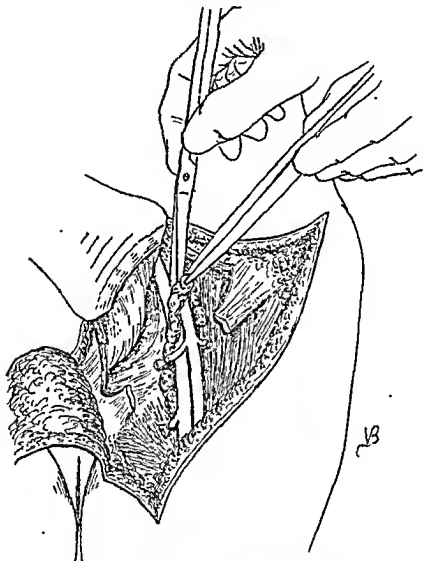


Fig. 77.—Removing the external iliac glands.

spine on the opposite side, and an area marked out identical with that just described, after which the operation proceeds in exactly the same way.

xii. Removal of the vulva.—The vulval area is now demarcated by an incision, which, starting at the point on the inner side of the

sodium alginate followed by the application of a solution of calcium chloride.

After-treatment.—A self-retaining catheter should be kept in the bladder for the first few days, and for the first 72 hours *tulle gras* is applied to the raw surfaces. When the area begins to granulate, alternate daily dressings of *lotio rubra* and Brilliant Green are carried out in the manner advised by Sampson Handley for large uncovered surfaces left after extensive operations for cancer of the breast. Healing by granulation necessarily takes some time, but in favourable cases is

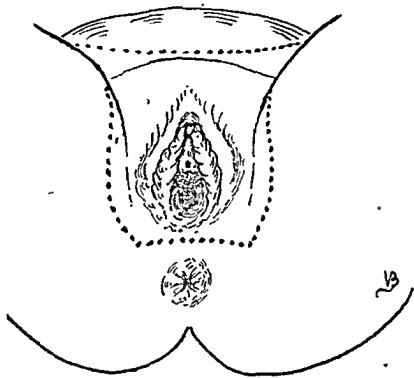


Fig. 79.—Diagram showing the lines of incision seen from below.

complete in from 3 to 4 weeks. Expert nursing is particularly necessary in these cases.

Complications.—The loss of serum from the large raw area may be considerable, and would, if not prevented, cause a rapid rise in the blood urea ratio, and other signs indicating undue fluid loss. If such eventuate, plasma by drip infusion is indicated, but the liability has been much diminished by the application on the operating table of a coagulant solution.

Surgical shock is less than might be expected, but if it ensues it should be treated by the measures described on p. 830.

The liability to wound sepsis is great after this operation, especially in the vulval area, but its severity is lessened by leaving this part of the

wound open, with free drainage. In Way's experience, immediate grafting, penicillin and the sulphonamides do not lessen it, but much benefit is gained by immersing the patient in a warm bath twice daily after the second day. When the wound begins to granulate and is clean, Tiersch grafting hastens healing.

Owing to the extensive removal of lymphatic channels, more or less lymphatic swelling of the legs occurs, but generally disappears within 18 months.

There is a liability to post-operative hernia, but the method of suturing described much reduces it.

Results.—The operation has a very definite mortality rate—11 per cent. in Way's hands—but it must be remembered that after the lesser operations, only about 25 per cent. of the patients remain cancer free for five years, whereas Way's achievement for 35 cases operated on 5 or more years ago is 53 per cent. Cancer of the vulva is not a common disease and the average surgeon in the course of his career does not have the opportunity of operating on a large number of cases. The best results will be attained where all the cases in a large area go to one institution for their treatment.

REMOVAL OF THE COCCYX

The coccyx may require to be removed because of severe pain due to various causes. The pain may be neuralgic or rheumatic in character, and more or less continuous, or it may trouble the patient only in defaecation or in sitting down, in which case the coccyx may be found to be fractured, dislocated, ankylosed, or the seat of chronic arthritis. In certain cases the presence of pain can only be attributed to a neurosis. Before deciding to remove the coccyx the surgeon must satisfy himself by careful examination that the pain complained of is really connected with this bone, and is not due to fissure in the anus or other rectal trouble, or to neurosis.

Preparation of the patient.—The perineum, anus, cleft between the two buttocks, and adjoining skin should be treated as described on p. 76.

Position.—The patient should be placed in the Sims semi-prone position, the buttocks pointing towards the window.

Instruments.—A scalpel, pair of scissors, dissecting forceps, six small pressure forceps, bone-forceps, two small retractors, two needles No. 7, Reverdin's needle, silkworm-gut, and catgut No. 1.

Operation.—The following are the steps of the procedure:

1. **Exposure of coccyx.**—An incision is made over the posterior surface of the coccyx and the structure exposed.

ii. *Freeing and removal of coccyx.*—The coccyx is next seized with a volsellum, freed with the scalpel from its deep connexions, and removed by disarticulation through the sacro-coccygeal joint (Figs. 80, 81).

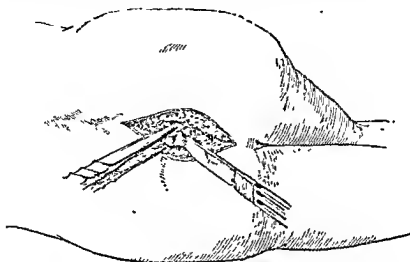


Fig. 80.—Excision of the coccyx: Freeing the tip of the coccyx.

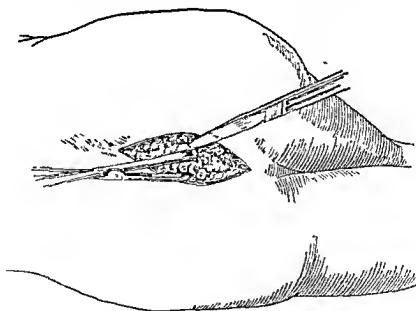


Fig. 81.—Dividing the lateral attachments.

iii. *Closure of wound.*—All bleeding-points having been arrested with catgut ligatures, the wound is closed with silkworm-gut, passed deep to the raw surface.

Danger.—At times the bleeding from the middle sacral artery is very smart, and if the end of the vessel is difficult to secure, a little piece of the sacrum must be chipped away, when the artery, which is more loosely attached higher up, can be secured.

Dressing.—A piece of sterilized gauze, a pad of wool, and a T-bandage must be applied.

After-treatment.—See Chapter xxx. The stitches are taken out on the 7th day, and the patient gets up on the 10th day.

CHAPTER VII

OPERATIONS ON THE VAGINA

ATRESIA OF THE VAGINA

THERE are various degrees of atresia of the vagina, and three types may be taken :

1. When there is a simple transverse septum across the vagina in some part of its course.
2. When the vaginal canal in some part of its course is absent.
3. When the vaginal canal is entirely absent.

In these conditions an operation may be indicated for retained menstrual fluid or to render the patient nubile.

With these malformations it will also be convenient to consider the operative treatment of hæmatometra.

1. TRANSVERSE SEPTUM OF THE VAGINA—IMPERFORATE HYMEN

In the cases of so-called "imperforate hymen" in which the menstrual fluid is retained, if a careful examination be made, the condition will be found to be due to a transverse septum of the vaginal orifice, the perforate hymen being stretched over the swelling that is presenting at the vaginal orifice. Occasionally, in certain cases, the septum is higher up the canal and, the septum being imperforate, a hæmatocolpos forms above it, the operation being similar to that we shall now describe. When the septum is perforate, the symptom for which the patient seeks advice is dyspareunia.

Preparation of the patient.—See p. 76.

Instruments.—A scalpel and a pair of ring forceps.

Operation.—A small incision is made in the bulging hymen from before backwards, and the thick blood and mucus allowed to escape without any assistance obtained by pressure on the uterus. When the flow of retained fluid decreases, the incision is enlarged, and another made at right angles to it ; but after this, authorities differ very much as to the best treatment. Some operators recommend that nothing else should be done beyond the application of a sterilized diaper, to be changed whenever it is soiled. Others insist that it is better to try to

remove all the retained fluid possible by gently irrigating with a boric-acid douche.

We think that if the vagina alone is distended the retained fluid should be evacuated as completely as possible by swabbing and douching, but that when the uterus itself is distended it is better to leave it to drain by itself.

Dangers.—The dangers connected with this operation are those of sepsis and hæmorrhage.

Sepsis.—This was a very real and serious danger in the past, and was due to organisms entering the dilated genital tract and finding therein a retained fluid upon which they could thrive, multiplying rapidly. The distended state of the Fallopian tubes, which is so often present, forms a route to the peritoneum, unless the ends of the tubes are sealed, and double suppurating bæmatosalpinx and general peritonitis have often resulted. Owing to the improvement in aseptic technique, these disasters must be very rare nowadays.

Hæmorrhage.—This is intraperitoneal, and is due to the rupture of a dilated Fallopian tube or tubes.

The fact that the Fallopian tubes are dilated cannot, however, at first be ascertained, and for this reason the abdominal swelling should not be pressed upon; since, if the Fallopian tubes are distended, it is proof that their ampullary ends must have been sealed, and the peritonitis causing this may also have fixed them, so that when pressure is applied there is a danger of their being ruptured or of the adhesions fixing them being torn.

If, after evacuation of the retained fluid from the vagina, the patient shows signs of intraperitoneal bleeding, the abdomen must be opened and the condition dealt with (*see* p. 837). This also should be done if, after the vagina has been evacuated, the Fallopian tubes are ascertained by bimanual examination to be dilated.

Dressing and after-treatment.—*See* Chapter xxx. The sterilized pads are to be removed when soiled. Douching is not required.

The patient should sit up during convalescence in order to assist drainage, and she should remain in bed until all discharge has stopped.

2. ABSENCE OF THE VAGINA

The vagina may be congenitally absent in whole or in part. When the whole is absent the uterus is generally absent as well, though the ovaries, in our experience, are usually present and normal. When the upper part only is absent, a functional uterus is more likely to be present, and as soon as the girl begins to menstruate, hæmatometra results. When the lower part only is absent, hæmatometra is still more likely, with the difference that the upper end of the vagina as well as the uterus becomes distended with blood.

The deformity generally escapes notice until the girl comes of an age to menstruate or is actually contemplating marriage, and in some cases is not discovered until she is married. Its treatment has been revolutionized by the grafting operation recently invented by McIndoe, for previously it could only be met by intestinal transposition (Baldwin's Operation).



Fig. 82.—McIndoe's operation: Incising over the site of the new vagina.

MCINDOE'S INLAY GRAFTING OPERATION

While we still describe Baldwin's operation, we give pride of place and choice to that of McIndoe, the results of which are remarkable. In detailing it we substantially adopt the author's own words.* The procedure is practically without risk if properly performed.

Instruments.—Catheter, bladder-sound, six pairs of pressure forceps, four pairs of light dissecting forceps, blunt-pointed scissors, ring forceps

* McIndoe: Hunterian Lecture, R.C.S., 1941.

scalpel, Reverdin's needle, curved needles No. 7 and 1, catgut No. 1, a long graft-cutting razor-blade knife, a wooden skin-tensor, the graft-carrying mould, a bottle of mastisol.

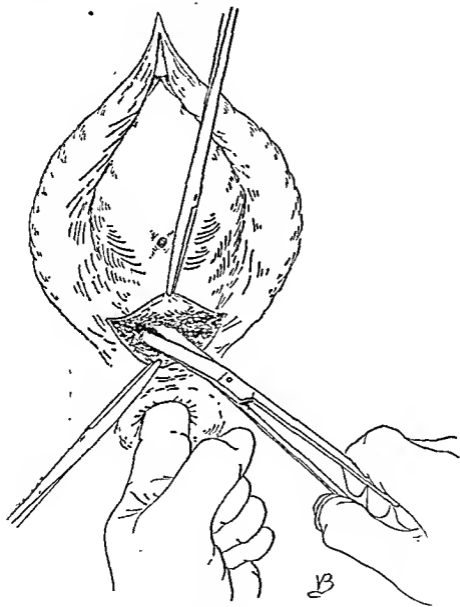


Fig. 83.—Beginning the separation of the bladder and rectum.

Operation. (1) Making a track for the new vagina.—The patient being placed in the lithotomy position, a transverse incision is made below the urethral orifice where the ends of the labia minora terminate (Fig. 82). Keeping a finger in the rectum, and if necessary a sound

in the bladder, the surgeon dissects up between the two until the peritoneum is reached (Fig. 83). Two gloves should be worn on the left hand and the outer one taken off as soon as a finger in the rectum is not required. By means of the two index fingers the cavity is now stretched laterally until it is large enough to take the graft-carrying mould. (Fig. 84). A few snips with scissors may be necessary if the edges of the levatores are rigid. The cavity is now packed with gauze wrung out of saline solution, to stop any oozing (Fig. 85).

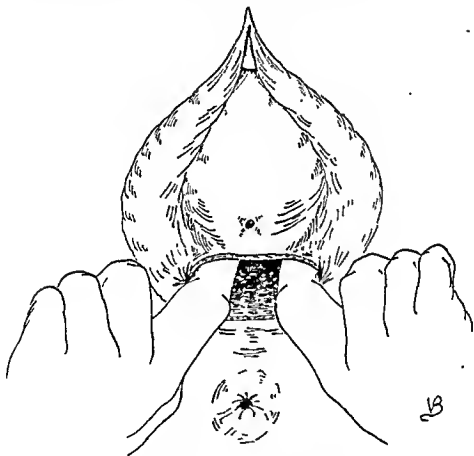


Fig. 84.—Stretching the excavation.

(2) Cutting the graft.—One leg is flexed and rotated outwards, and the fleshy part of the thigh is supported by a hand. A large thin razor-graft is cut from its inner surface. It should measure about 10 inches by 3 inches, and be without holes or breaks in continuity. The skin is tensed by the wood skin-tensor while the graft is being cut and, as the graft comes off, it is picked up with forceps by an assistant so as to keep it clear of the edge of the knife (Fig. 86). The graft is wrapped in moist

saline gauze and the leg dressed with tulle-gras and lightly bandaged.

(3) The graft-carrying mould (Fig. 87).—This is made of thin polished vulcanite and is hollow for the sake of lightness. The standard size measures 10 cm. by 4.5 cm. at the widest part of its circumference, but in special cases the size and shape are modified.

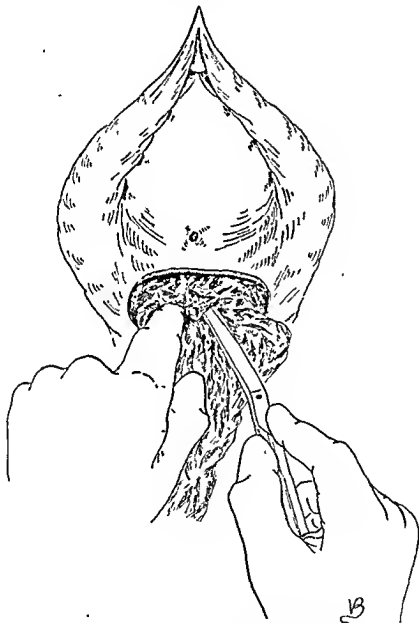


Fig. 85.—Packing the excavation with gauze.

(4) Trial fitting of the mould.—The gauze being removed from the track of the intended vagina, the mould is fitted into it. It should lie completely within the perineum and fit the cavity firmly. If the cavity

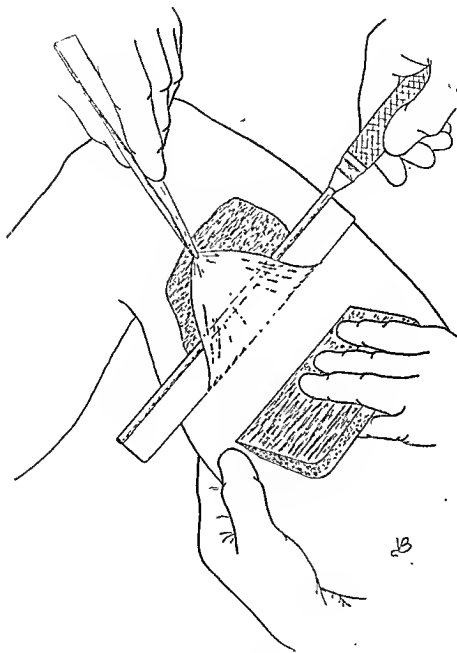


Fig. 86.—Cutting the graft.

is too small it must be enlarged. When dissecting up between the rectum and bladder it is important not to make the upper end of the cavity too large.

(5) Applying the graft to the mould.—An assistant now holds the washed and dried mould vertically by its lower end, and its surface is painted with mastisol. The graft is spread out as an oblong sheet,

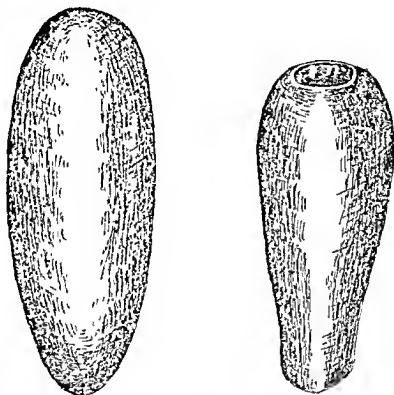


Fig. 87.—Two types of mould: on the left, the usual shape; on the right, the shape when a functional uterus is present.

raw surface upwards, and its four corners are picked up with light dissecting forceps (Fig. 86). It is now lifted and transferred to the mould so that it is evenly draped and no gaps left (Fig. 88). When the upper end of the mould is covered, the assistant holding it reverses it so that the lower end can be draped. Only an overlapping seam on each side should reveal the break in continuity of the skin covering. By means of the mastisol the skin adheres closely to the vulcanite. When the mould is completely covered by the graft any excess pieces are trimmed off with scissors.

(6) Insertion of the graft.—A final inspection of the track is now made to see that bleeding is not going on, for bleeding interferes with adhesion

of the graft. The surgeon, being certain of this, now slides the graft-covered mould into the track (Fig. 90).

(7) Incising the labia.—An incision is now made outwards on each side into the labia (Fig. 91).

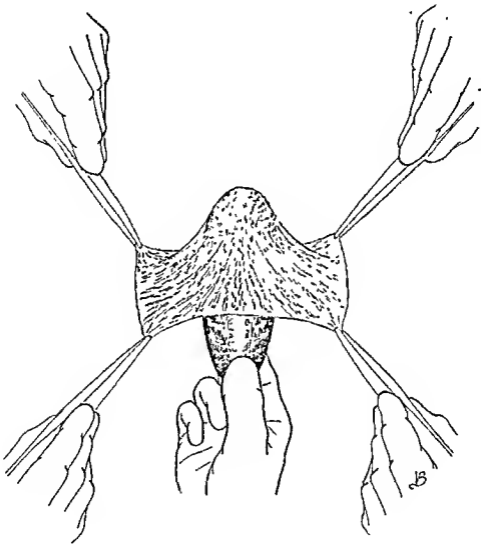


Fig. 88.—Draping the mould.

(8) Suturing the labia across the opening of the track.—In order to prevent the mould coming out, the two inner edges of the incisions made are now sutured together with interrupted catgut sutures (Fig. 92), and

then the two outer edges are similarly brought together so that the two tiers of sutures make an operculum. A small hole is left under the meatus to allow of drainage (Fig. 93).

Post-operative treatment.—The howels are kept confined for 4 or 5 days in order not to disturb the graft. In spite of the large size

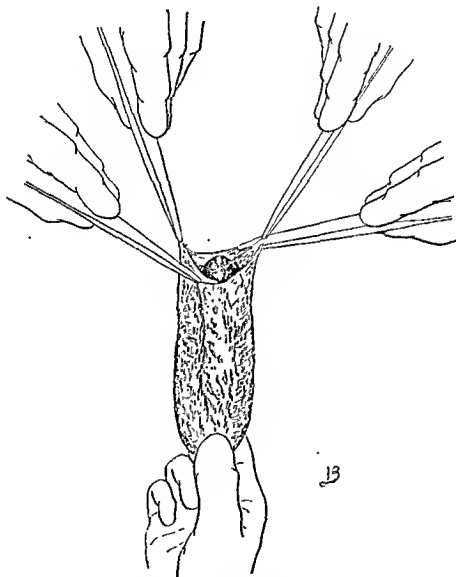


Fig. 89.—Completing the draping.

of the mould, the local discomfort is not great, but the thigh from which the graft was taken is painful. There is always more or less discharge, fairly profuse and offensive at first, but later it is almost odourless. The patient is usually up and about at the end of 3 weeks. Sitting is, as

a rule, uncomfortable but an air ring helps. The mould is left in for 4 months if the patient tolerates it well, but if not it may be withdrawn at the end of 2 or 3 months. In either case the new vagina must be kept open by wearing, for another 3 to 6 months, a glass vaginal 'rest' (usually size 6), for it is essential to keep the new canal dilated until

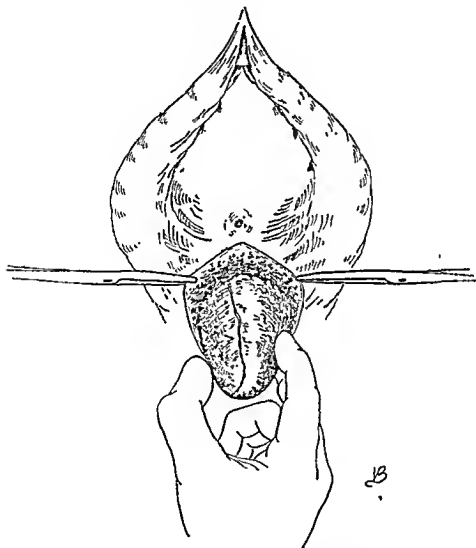


Fig. 90.—Inserting the draped mould.

all tendency to contraction has passed away. The patient should be seen every 2 or 3 weeks during this later period so that the surgeon, removing the 'rest,' may treat any small granulating surface where the skin graft has not taken. As soon as healing is complete the patient (if engaged) should be encouraged to marry.

Difficulties.—The chief difficulty is the cutting of the large one-piece graft, which requires special skill. Mechanical devices for cutting such grafts are obtainable, and if the surgeon has no experience of graft-cutting he should employ a skilled assistant for this part of the operation, or use a dermatome. There is a certain amount of fever after the

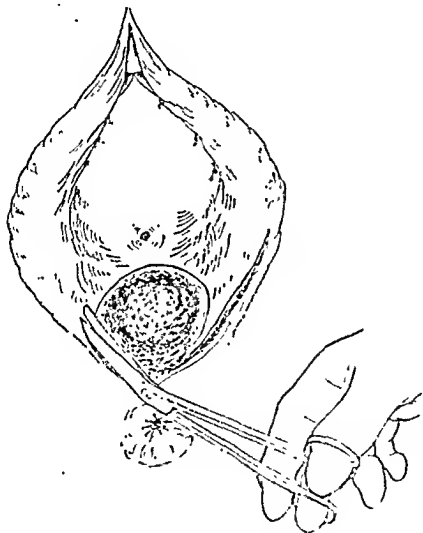


Fig. 91.—Splitting the tabia.

operation, but the patient is not seriously ill, and a perfect result was obtained in 89 per cent. of the eighty patients operated on, up to date, by McIndoe. In two cases the mould ulcerated into the rectum, having been left *in situ* too long, but in both cases the fistule closed spontaneously. The process depends on whether the graft takes entirely or whether there are areas where it has failed to take. These are caused by coagulation of blood after the mould has been inserted, and present a granulating surface which, if left alone,

becomes exuberant and polypoid so that epithelialization becomes impossible. Such polypi should be curetted away and their bases cauterized with trichloroacetic acid or iodised phenol, followed by frequent douches of the hypochlorite type. Epithelialization rapidly follows when the granulations are smooth, firm, and salmon-pink, with clean healing edges. On no account must dilatation be omitted during this stage of healing. Where the unepithelialized surface is large, a secondary graft applied on the vaginal rest is advisable and the same applies to small surfaces if they are reluctant to heal. It is particularly

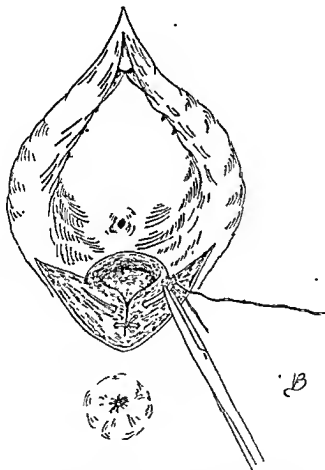


Fig. 92.—Suture of the inner edge of the split.

important to see that the rectum does not become loaded with faeces while the mould is in position for the pressure may cause necrosis of the rectal wall where it lies against the mould.

Variations in the operation.—It is very rare for a functional uterus to be associated with congenital absence of the vagina, but two cases can be cited. In the first the deformity was noticed when an abdominal

tumour was discovered in a young girl who had never menstruated though she had suffered from periodic pain. The tumour was found to be the uterus distended with menstrual blood and, after hysterotomy had been performed and the blood evacuated, a track was made downwards from the uterus to the space between the urethra and anus. Into this track McIndoe inserted a graft on a special mould with a hole

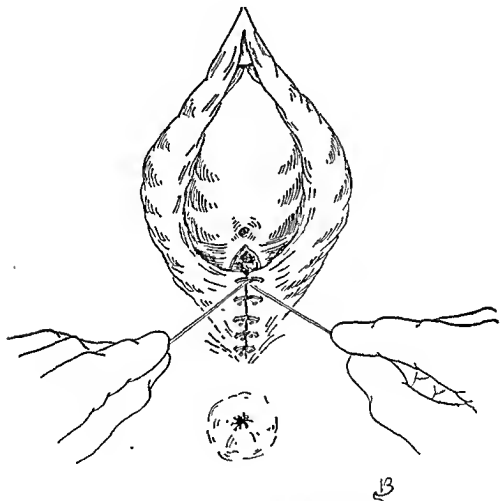


Fig. 93.—Suture of the outer edge of the split.

through it to allow the escape of the menstrual flow while the mould was *in situ*. The case was entirely successful and the patient now has an apparently normal vagina and menstruates regularly.

The second case is unique. A girl was seen by Victor Bonney who had no vagina, but a completely double uterus into which she was menstruating with increasing monthly pain. Having made a track for the vagina, he opened the abdomen and joined the two halves of the uterus and, as neither of them had a cervix, from the lateral cellular tissues he fashioned an artificial one over a tube on which McIndoe had

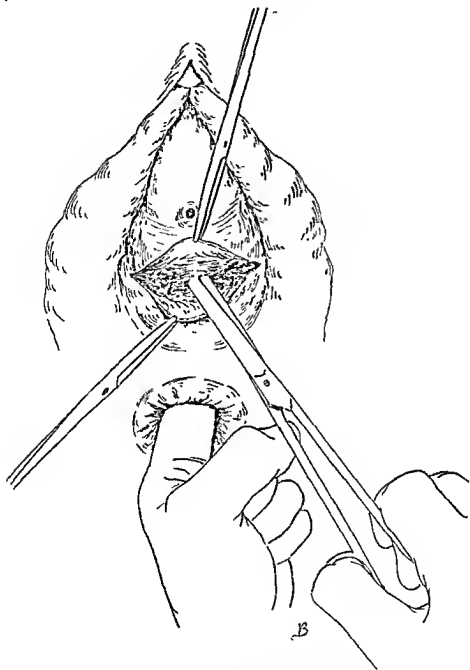


Fig. 94.—Baldwin's operation: Making the track for the new vagina. .
 fixed a graft. A graft was then inserted in the vaginal track. The
 result was perfect and the patient married.*

* Victor Bonney and A McIndoe (*Journ Obst Gyn. Brit. Emp.*, 1944, No 1, li, 24),
 but since the above paper appeared, trysterectomy had to be performed on account of
 scar contraction of the newly fashioned cervix. In any future operation for the same
 condition the graft in the cervix should be carried on an extension of the vaginal mould
 and left in position for the same length of time.

The inlay graft operation is also applicable to those cases in which only part of the vagina is absent or in which, as the result of injury or burning, the canal has become gravely stenosed. The size and shape of the mould will depend upon the shape and extent of the deformity.

BALDWIN'S OPERATION

Although we think that this operation ought to be entirely superseded by McIndoe's operation we continue to describe it as the ingenuity of its principle has an educational value which extends beyond the purpose for which its inventor designed it.

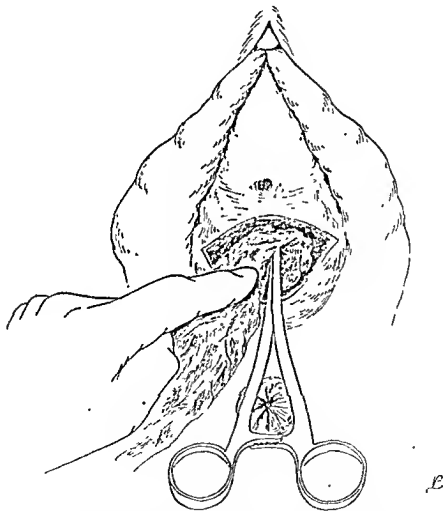


Fig. 95.—Packing in the ring-forceps with gauze.

Preparation.—See pp. 76-78.

Instruments.—Two separate sets of instruments are required :

1. *For the abdominal part of the operation.* The instruments are the same as those mentioned on p. 274 with the addition of an enterotribe ;

2. For the perineal part of the operation. Those mentioned for McIndoe's operation (p. 126) without the graft-knife, tensor and mould.

Operation.* i. Making a bed for the new vagina.—The surgeon proceeds in the same manner as described in the account of McIndoe's

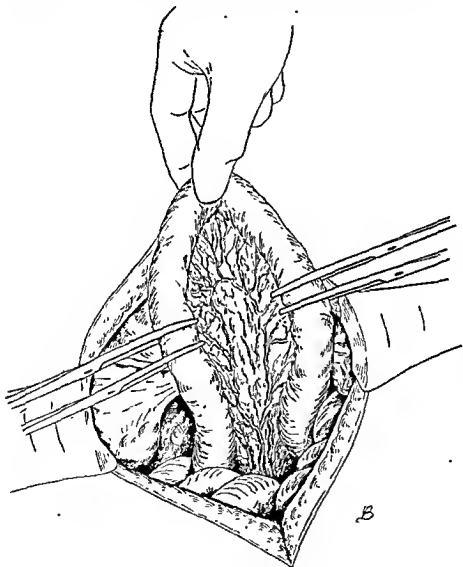


Fig. 96.—Choosing the coil of ileum.

operation until the peritoneum is reached (Fig. 94). A ring forceps is now passed up to the top of the channel so made, and kept there by packing gauze round it (Fig. 95).

ii. Selection of the coil of ileum.—The patient is now placed in the

* Victor Bonney, "Formation of an Artificial Vagina by Transplanting a Portion of the Ileum (Baldwin's Operation)," *Lancet*, Oct. 13th, 1913

Trendelenburg posture and the abdomen opened in the middle line. The surgeon then selects that coil of ileum which has the longest mesentery; as a rule, this will be found to be situated some 12 inches from the ileo-cæcal junction. Trial should be made of various coils, pulling each one downwards as far as it will go, so as to measure if

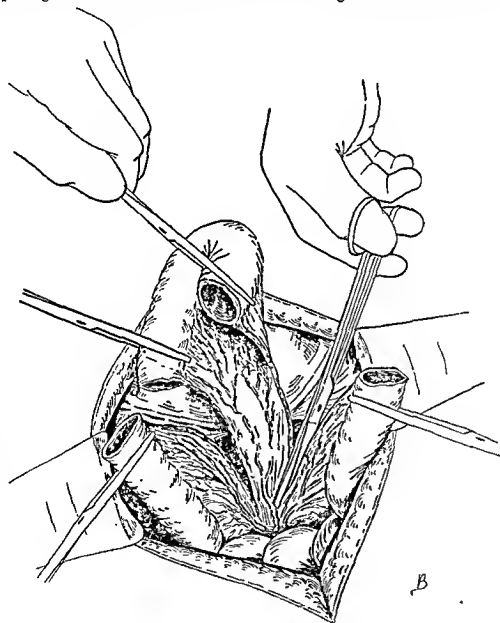


Fig. 97.—Isolating a segment of the coil.

it can be pulled down into the situation of the vagina. The coil being selected, it is withdrawn from the abdomen, and all the rest of the operation area is carefully packed off with sterile towels and swabs

iii. Isolating the coil of ileum.—A portion of the gut 5 inches long and having as its centre that point which can be pulled furthest downwards towards the pubes, together with the V-shaped portion of mesentery attached to it, is now isolated by dividing the bowel on either side of it and continuing the incisions downwards to the base of the mesentery (Fig. 97).

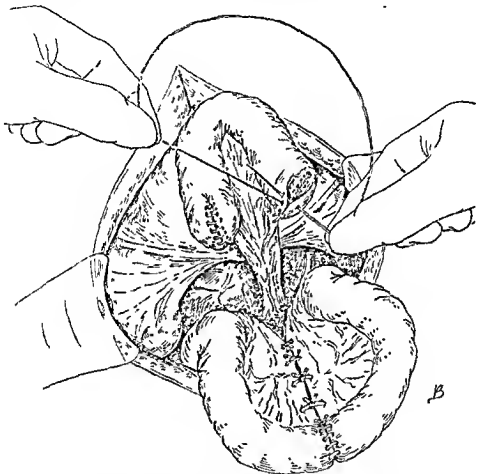


Fig. 98.—Closing the ends of the isolated segment.

Care must be taken in making the incisions in the mesentery not entirely to cut off the blood supply to the isolated segment of intestine, of which there may be some danger, as in order sufficiently to mobilize the segment the mesentery will have to be divided right down to its base.

Ring forceps or light intestinal clamps must be placed on either side of the lines of division of the intestine to prevent the escape of the contents.

iv. Restoring the continuity of the intestine.—The ends of the

isolated segment having been securely closed by a double layer of sutures (Fig. 98), the continuity of the intestine is restored by circular anastomosis and suture of the edges of the mesentery, *taking care that the isolated segment and its portion of mesentery lies lowermost (nearest to the pubes).*

v. Grasping the isolated segment of ileum.—The covering towels

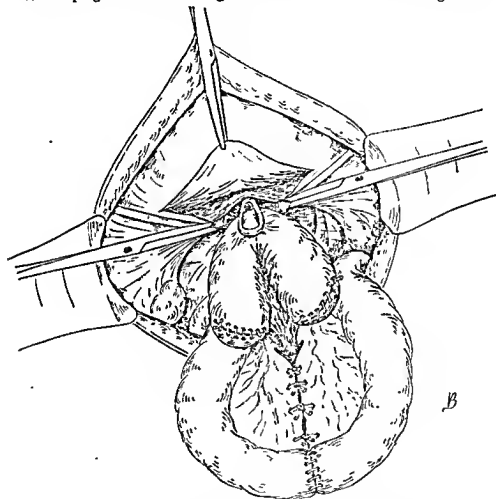


Fig. 99.—Pulling the isolated segment into the track provided for it.

and swabs being now removed, an assistant from below pushes upwards the ring forceps previously placed in the channel between the bladder and rectum. The surgeon then incises the peritoneum covering the end of the forceps, together with the nodule of tissue that marks the point where the round ligaments and ovario-uterine ligaments blend in the middle line, so that the forceps can be pushed forwards into the peritoneal cavity. The incision through the peritoneum should be extended laterally on either side and a peritoneal flap turned up. The ring forceps is now made to grasp the isolated segment of ileum at its mid-point, and it is then pulled downwards into the channel

fashioned for its reception (Fig. 99). This is the most difficult stage of the operation for, if the mesentery is short, considerable traction may have to be exercised and some manipulation used before the ends

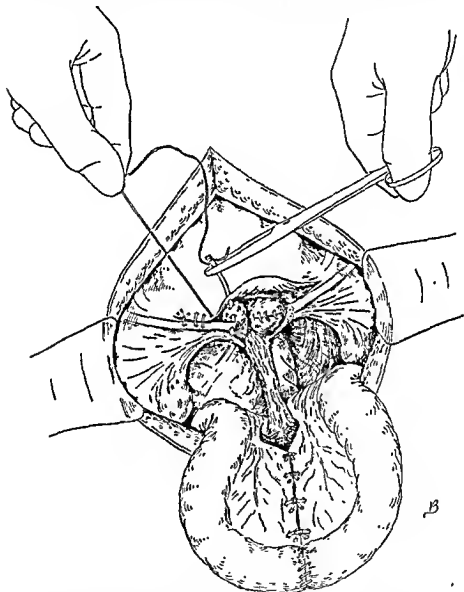


Fig. 100.—Fixing the upper extremity of the isolated segment.

of the segment can be made to descend sufficiently to allow the incised peritoneum to be sutured over them.

It will be noted that the segment is pulled down *doubled up*.

vi. Anchoring the upper end of the isolated loop of ileum.—The stump of the conjoined round ligament and ovario-uterine ligament on either side should now be sutured to the upper ends of the isolated

loop. If this step of the operation is omitted, there is considerable likelihood of the new vagina subsequently prolapsing. The peritoneal flap previously made is now sutured over the top of the isolated loop, burying, as it does so, the stumps of the ligaments referred to (Fig. 100).

vii. Closing the abdominal wound.—See p. 286.

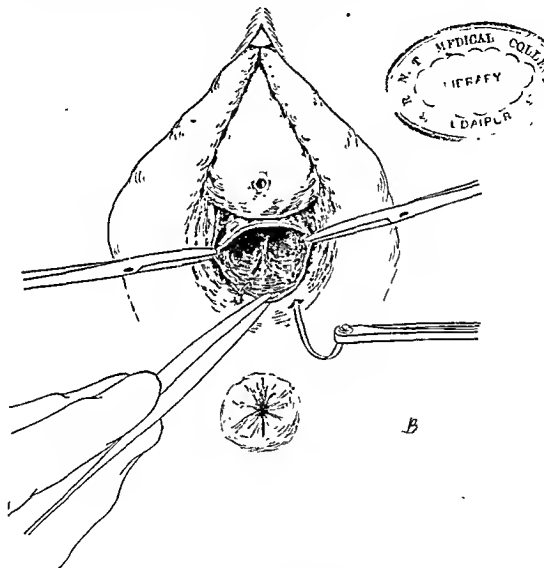


Fig. 101.—Suturing the opened segment to the vulva.

viii. Opening and suturing the loop of isolated ileum from below.—The patient is again placed in the lithotomy position, and the most advanced part of the displaced intestine is pulled down, until it appears at the perineal surface. It is then opened by an incision in the longitudinal axis of the gut, and the edges of the opening are sutured to the skin edges of the original perineal incision (Fig. 102).

ix. Division of the septum.—Since the segment of intestine has been pulled down doubled up, it will be seen that the new vagina is double, each half being formed of one limb of the doubled-up segment.

The conversion of the double into a single vagina should not be carried out until at least 3 months after the major part of the operation. It can then be effected either by directly incising the septum between the two limbs and picking up the vessels, or by applying an enterotribe and leaving it on till it sloughs off. In some of the recorded cases such a conversion has not been found necessary.

Difficulties and dangers.—The chief difficulty is to mobilize the segment of intestine sufficiently to allow of its being pulled down to the vulva without undue force. The segment should not be made longer than 4 inches (2 inches to each limb) after allowance has been made for invaginating each end. In the process of pulling down, the segment becomes elongated, and a length more than that advised may make it impossible to bring the peritoncum together over the bowel ends.

The principal danger of the operation is undue traction on the piece of isolated mesentery. If this traction is excessive, the circulation to the isolated loop of ileum may be cut off. The ease with which the intestine can be pulled down varies in different patients. In cases in which the tissues are loose and the mesentery is long, the segment of bowel comes down with the greatest ease. In cases in which the tissues are rigid and the mesentery short there is considerable tension. Our experience is that the operation in most of our cases has been followed by considerable flatulent distension and vomiting, lasting over several days. This we ascribe to the tension on the mesentery. The operation has a definite mortality though nearly all *reported* cases have recovered. Of the two fatalities of which information has been given both died from intestinal obstruction at the site of the anastomosis. This disaster is obviously avoidable.

OPERATIONS FOR HÆMATOMETRA

In the rare condition of hæmatometra accompanied by congenital absence of the vagina, in whole or in part, the uterus should be emptied by abdominal hysterotomy, and a track made down from it to the vulva, between the bladder and urethra in front and the rectum behind. Into this track an inlay graft should be inserted as in McIndoe's operation.

A hæmatometra caused by imperforate hymen drains itself when the septum is incised, but when the condition results from extensive scarring of the cervix or upper vagina, hysterectomy is, as a rule, the best treatment, although the principles of McIndoe's technique might be applied in a young woman.

HEMATOMETRA OF AN UNDEVELOPED HORN

This rare condition requires operative treatment. The distended horn lies close against the unicorn uterus, of which it forms the other half, and it may be mistaken for a blood-cyst of the broad ligament if the relation of the round ligament to the tumour is not observed.

It is usually possible to remove it, leaving the functional half of the uterus intact, by an operation similar to that of salpingectomy (p. 643).

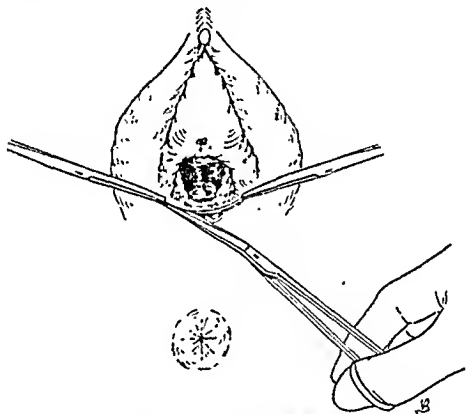


Fig. 102.—Fenton's operation: Making the incision.

LONGITUDINAL VAGINAL SEPTA

A septum of the vagina may be longitudinal, and when complete produces a double vagina.

Preparation of the patient.—See p. 76.

Instruments.—Vaginal retractor, scalpel, six pairs of pressure forceps, dissecting forceps, Reverdin's needle, four half-circle needles No. 9, catgut No. 2, a catheter.

Operation.—The septum should be divided and, if there is much bleeding, which is unusual, the raw surfaces should be closed with sutures, after which flavine gauze should be packed into the vagina.

Dressing and after-treatment.—See Chapter xxx. The patient gets up on the 10th day.

VAGINISMUS

Most patients with vaginismus are cured by enlarging the vaginal orifice by a plastic operation, because the spasm, as a rule, is secondary to the pain caused by a narrow or relatively narrow vaginal orifice. Stretching the vaginal orifice followed by the insertion of glass dilators is

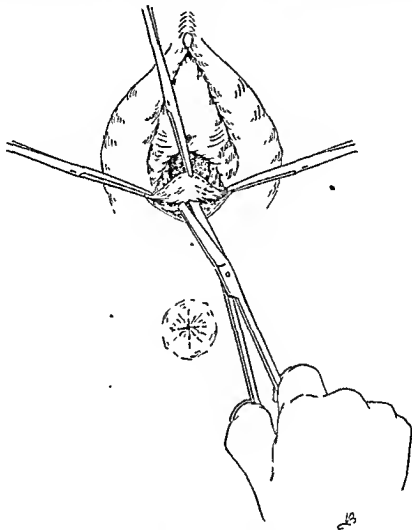


Fig. 103.—Reflecting the vaginal flap.

still advocated by some gynæcologists, but we have found it to be most unsatisfactory,

FENTON'S PLASTIC OPERATION

Preparation of the patient.—See p. 76.

Instruments.—Scissors and scalpel, four pairs of pressure forceps,

dissecting forceps, Reverdin's needle, four curved needles No. 7, catgut No. 1.

Operation. i. Making the vaginal flap.—A pair of short pressure forceps is applied to the junction of the skin and mucous membrane just outside either end of the fourchette, and the muco-cutaneous

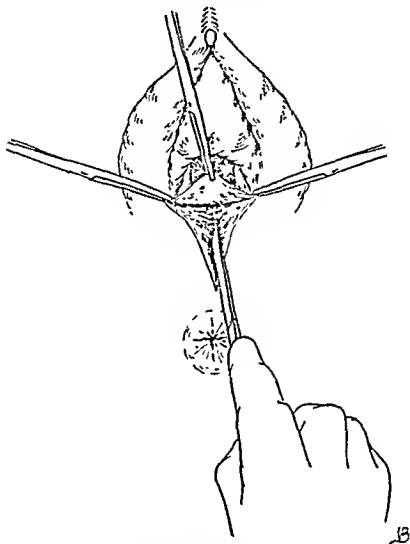


Fig. 104.—Dividing the perineum.

junction is divided between them (Fig. 102). A flap of mucous membrane is then dissected upwards, carrying the lower segment of the hymen with it (Fig. 103).

ii. Incision of the perineum.—The perineum is incised vertically in the middle line to within half an inch of the anus. The incision divides all the perineal structures. Care must be taken not to injure the bowel. The wound then gapes, and a raw surface, more or less diamond-shaped, is formed (Fig. 104).

iii. **Dividing the hymen.**—Two small incisions are now made in the flap from its free edge upwards, about a quarter of an inch from the middle line, so that the hymen is divided in two places. The edge of the flap thus notched is straightened out by pulling on the two forceps.

iv. **Inserting the fixing suture.**—A mattress-suture is now applied by passing the needle from the vaginal surface of the flap a little below its base and withdrawing one end of the suture; again passing the needle from the vaginal surface, including this time a piece of the perineal

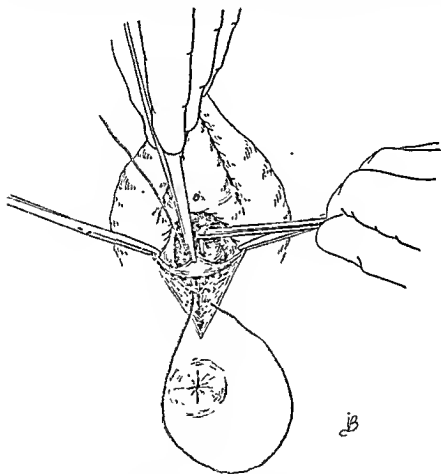


Fig. 105.—Inserting the fixing suture.

tissue, and then withdrawing the other end. The two ends are now tied, thus fixing the flap and preventing its withdrawal if the skin sutures become absorbed too soon (Fig. 105).

v. **Suture of the flap.**—Sutures are now inserted so as to affix the cut edge of the flap of vaginal wall to the cut skin-edges (Fig. 106), the upper and lower angles of the wound are approximated, and the resulting scar is transverse to the long axis of the vagina. If there is

troublesome oozing of blood from the cut perineal tissue, it can be arrested by ligatures before the flap is sutured to the skin.

Dressing and after-treatment.—For the general lines, see Chapter xxx. The stitches are left to separate. The patient should be made to realize that she has now no need for apprehension, as the opening is large. The subsequent use of glass dilators is quite unnecessary.

MYOMA OF THE VAGINA

Preparation of the patient.—See p. 76.

Instruments.—Auvard's speculum, vaginal retractor, bladder-sound,



Fig. 106.—The operation completed.

scalpel, scissors, six pairs of long pressure forceps, dissecting forceps, Reverdin's needle, four half-circle needles No. 7, catgut No. 1, catheter,

Operation.—The method to be chosen depends upon whether the tumour is pedunculated or sessile.

PEDUNCULATED MYOMA.—The mucous membrane covering the pedicle at its junction with the tumour should be incised and reflected and the tumour shelled out, or the pedicle, if thin, ligatured *en masse*.

In the former case the pedicle should be ligated with mattress-sutures of catgut to check hæmorrhage, and the mucous membrane over it then brought together with a few interrupted sutures.

SESSILE MYOMA. I.—Defining the limits of the tumour. If the

tumour is on the anterior or posterior vaginal wall, the sound is passed into the bladder or the index finger into the rectum if there is doubt as to the relation of these organs to the tumour.

ii. **Splitting the capsule.**—The tumour is seized with a volsellum and the vaginal wall covering the tumour, together with the capsule, is then incised (Fig. 107).

iii. **Enucleation of the tumour.**—The vaginal wall and capsule

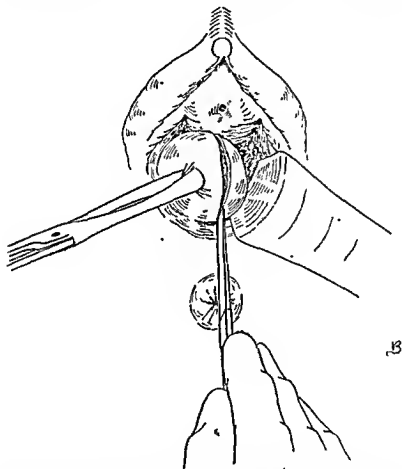


Fig. 107.—Removal of a vaginal myoma: Incising the capsule of the tumour.

having been reflected, the volsellum is attached to the tumour, which, being dragged upon, is easily enucleated with the finger or handle of the scalpel (Fig. 108).

iv. **Obliteration of the enucleation cavity.**—If the enucleation cavity is large it should be obliterated by continuous or interrupted catgut suture, in a manner similar to that described under excision of Bartholin's cyst (p. 96).

v. **Suture of the mucous membrane.**—The cut edges are united

with a continuous catgut suture. If any spurting vessels can be seen, these should be ligated in the usual way before the wound is sutured.

Dangers.—The bladder, ureters, or rectum may be wounded during the enucleation.

Dressing and after-treatment.—See Chapter xxx. The patient gets up in 10 days.

VAGINAL CYSTS

Preparation of the patient.—See p. 76.

Instruments.—Auvard's speculum, vaginal retractor, scalpel, scissors,

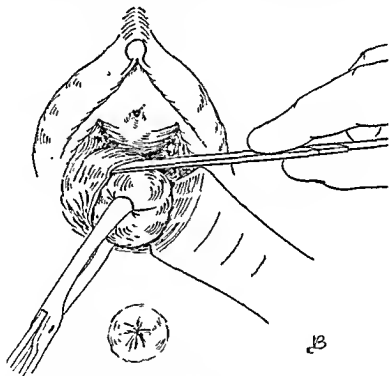


Fig. 108.—Enucleation of the tumour.

dissecting forceps, six pairs of long pressure forceps, four half-circle needles No. 7 or Reverdin's needle, catgut No. 1, catheter.

Operation.—Auvard's speculum is inserted into the vagina if the cyst is on the anterior wall, or a vaginal retractor is held in position against the anterior vaginal wall by an assistant if the cyst is on the posterior wall.

The tissue covering the cyst is seized with rat-toothed dissecting forceps and carefully incised till the cyst wall is exposed. The cyst is enucleated with the index finger or handle of the scalpel. The excess of tissue covering the cyst is cut away, any oozing is stopped, and the wound united with sutures.

Complications.—With the primary incision or during the enucleation

the cyst may burst or shelling-out may be impossible. In either event the cyst wall will then have to be stripped out after it has burst or been incised. This will need careful dissection if it is very adherent.

Dangers.—If the cyst is large there is a danger of wounding the ureter, bladder, or rectum, and the bleeding may be free. In such a case, therefore, it may be safer either to open the cyst, plug it with gauze, and let it heal by granulation, or to remove only that piece of the cyst wall, together with the mucous membrane covering it, which projects towards the vaginal canal. The edge of the cyst wall can then be sutured to that of the mucous membrane, the remainder of the cavity being plugged with gauze and allowed to granulate up.

Dressing and after-treatment.—See Chapter xxx. The patient gets up in about 14 days.

PARTIAL VAGINECTOMY FOR MALIGNANT DISEASE OF THE VAGINA

The vagina may be the seat of sarcoma in early life, and of carcinoma at a later period.

As a rule, the patient applies for relief too late for any operative measures short of hysterovaginectomy, Wertheim's operation or pelvic exenteration. (See pp. 265, 364 and 406.) If she is seen at an early stage of the disease and the growth is situated close to the outlet, it may be removed by partial vaginectomy.

Preparation of the patient.—See p. 76.

Instruments.—Vaginal retractor, scalpel, bladder-sound, six pairs of long pressure forceps, dissecting forceps, four half-circle needles No. 7 or Reverdin's needle, catgut No. 1, catheter.

Operation.—The relation of the bladder and rectum having been ascertained, the speculum is inserted so as to expose the growth, which is then steadied by the forceps. The mucous membrane having been incised all round the lower end of the vagina and well clear of the growth, the lower end of the canal should be freely separated, by scissors and the finger, up to a point well above the growth. The lower end of the vagina is then cut away, and the remainder is pulled down until it can be sutured to the vulva along the line of the original incision. Bleeding can usually be stopped by sutures passed through the raw surface; if not, the bleeding points must be ligatured. When the bleeding has ceased, the mucous membrane is sutured.

Difficulties.—If the disease occurs in an elderly woman the vaginal canal may have atrophied, and in this case it may be a difficult matter to get at the growth properly. If so, a paravaginal section (p. 267) will be found of great service. The operation is only suitable for very small growths low down in the canal.

Dangers.—The bladder may be injured during the removal.

Alternative method.—If the growth is extensive, and is not limited to the first inch of the vagina, hysterovaginectomy is the best treatment (see p. 265).

Dressing and after-treatment.—See Chapter xxx. The patient gets up in a fortnight.

URETHRO-VAGINAL FISTULA

Preparation of the patient.—See p. 76.

Instruments.—A catheter, Auvard's speculum, scissors, dissecting forceps, bladder-sound, four pressure forceps, curved needles No. 11, Reverdin's needle, catgut No. 1 20-day and No. 0 10-day.

Operation.—A bladder-sound having been introduced into the urethra, the vaginal mucous membrane in the neighbourhood of the fistula for about half an inch is dissected off. The hole in the mucous membrane of the urethra is closed with fine catgut, and the vaginal wall brought together with a continuous suture of No. 1 catgut.

When the sutures are tied the fistulous opening is entirely obliterated.

Dressing and after-treatment.—See Chapter xxx. The patient gets up on the 10th day.

VESICO-VAGINAL FISTULA

A vesico-vaginal fistula may be closed either from the vagina or from the abdomen.

VAGINAL OPERATIONS

The following operations will be described—paring and flap-splitting.

Preparation of the patient.—In addition to the preparation mentioned at p. 76, the surgeon must be sure that there is not any cystitis and that the bladder, except for the fistula, is in a healthy condition. If cystitis is present, this must first be cured by appropriate treatment, for the chances of the operation-wound uniting if the urine is already septic are remote.

Instruments.—Auvard's speculum, vaginal retractors, scalpel, dissecting forceps, six pairs of long pressure forceps, four half-circle needles No. 13, Reverdin's needle, 20-day catgut No. 1, 10-day catgut No. 0, silkworm or nylon gut, silver wire, catheter.

PARING

This operation is suitable only for a very small and easily accessible fistula.

i. Irrigation of the vagina and bladder.—Auvard's speculum is inserted into the vagina which is then thoroughly douched with a solution of 1-in-1,000 flavine, and the bladder, by means of a catheter in the urethra, is also washed out through the fistula.

ii: Excision of the vaginal mucous membrane in the region of the fistula:—The anterior vaginal wall having been exposed, a curved incision is made through it with a sharp scalpel, surrounding the fistula and about half an inch from its edge, by which means the amount of vaginal wall to be reflected upwards is delineated. The area of mucous membrane thus determined is then carefully dissected off the bladder, leaving an oozing raw surface.

iii. Insertion of sutures.—Sutures are now inserted. The needle is entered through the vaginal mucous membrane just externally to the raw area, and is kept deep to the raw surface and brought out at one edge of the fistula. The needle is then re-inserted in the opposite edge of the fistula, kept deep to the raw surface on that side, and brought out through the mucous membrane of the vagina clear of the raw area. After a sufficient number of sutures have been inserted, the bladder is carefully washed out with warm boric solution, which is passed by means of a catheter through the urethra, and escapes, together with any blood-clots, into the vagina through the fistulous opening. The fistula is then closed by tying the sutures. It will invariably be found that the opening in the bladder mucosa is much larger than the opening on the surface of the vagina.

We are of the opinion that the best suture materials to use for the paring operation are silkworm-gut or silver wire because either may be left *in situ* for a much longer time than any other form of suture.

Difficulties.—On account of the cicatricial contraction of the tissue in the neighbourhood of the fistula, it may be impossible to bring the edges of the opening together, or, having done so, it may be found that the tension on the stitches is so great that the sutures will probably cut out. Cases of this sort are not suitable for the paring operation. If, however, the paring operation has been attempted, the cicatricial tissue in the neighbourhood of the fistula may be divided first by incising it in a direction parallel with the long axis of the vagina on either side, thus freeing the edges of the fistula, after which it is closed in the manner already described. The wounds in the vaginal mucous membrane made to relieve tension are then closed with sutures, so that the direction of the incisions will eventually be at right angles to the long axis of the vagina.

Dangers.—In removing the area of mucous membrane from the anterior vaginal wall the mucous membrane of the bladder will be incised and sometimes the rather free oozing may be difficult to arrest. Irrigation with hot water, and the application of sutures if this is unsuccessful, may be necessary. If any portion of the mucous membrane of the bladder becomes tucked into the wound when the sutures for closing the fistula are tied, healing will not be complete and a small fistulous track may remain. If the fistula is near the orifice of the ureters, care will have to be exercised that they are not injured when

preparing the raw surface round the opening, or when passing the sutures.

Lastly, at times, after the operation is completed there is rather free oozing of blood into the bladder. If this takes place, the bladder must be thoroughly irrigated every hour or two with hot boric solution containing adrenaline (1-in-1,000) through a double-channelled catheter,

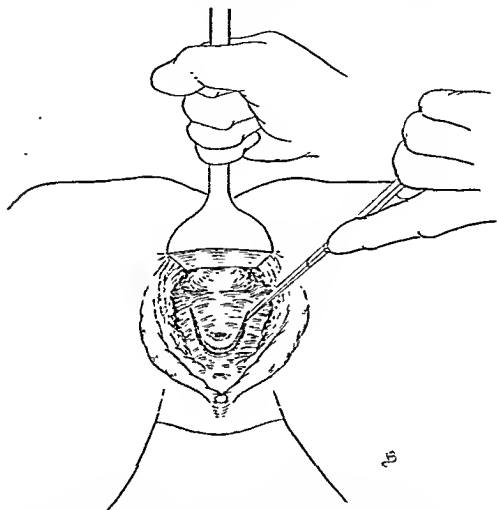


Fig. 109.—The flap operation for vesico-vaginal fistula: Demarcating the flap with the patient in the reversed Trendelenburg posture.

to prevent the clot from accumulating in the bladder and so interfering with the sutures.

Dressing.—A catheter is fixed in the bladder by a suture at the meatus, and this is subsequently connected to a suction apparatus. By this means the bladder can be continuously catheterized for a week, after which it should be emptied every 2 hours for the next 2 or 3 days, and then at progressively increasing intervals. Most particular care must be taken that the bladder is not infected during the necessary

manipulations. At the end of 3 weeks the patient may be permitted to pass urine naturally. Urotropine in 10-grain doses should be given 3 times daily during the whole of the convalescence from the operation. If silkworm-gut or silver wire sutures have been employed,

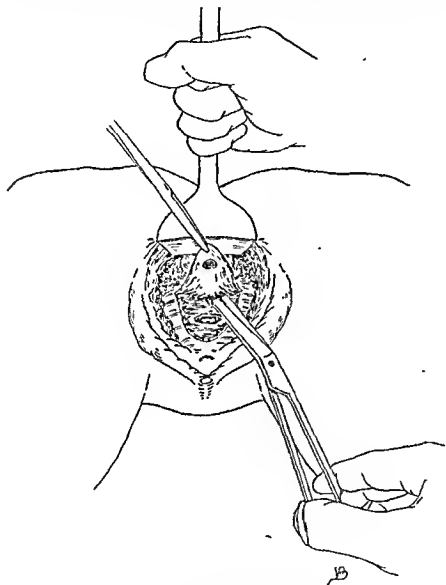


Fig. 110.—Raising the flap.

as is advisable, they should be left in for 3 weeks, all being well, and then removed under an anæsthetic.

After-treatment.—For general lines, see Chapter xxx.
The patient gets up at the end of 3 weeks.

FLAP-SPLITTING

This is a more elaborate but better operation, especially in cases in which the defect is large. Its exact technique will require to be varied according to the position and size of the fistula. The steps are commonly as follows :

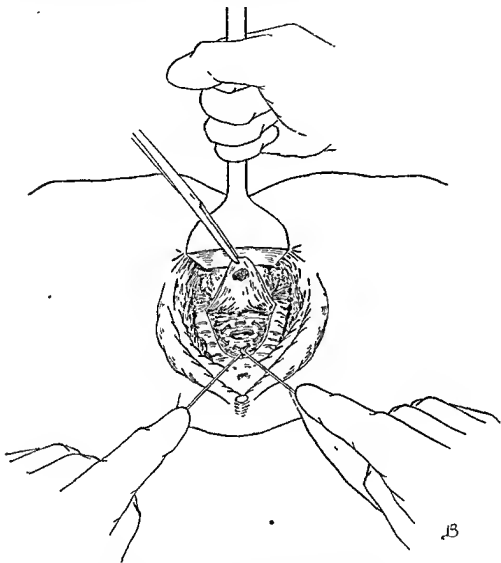


Fig. 111.—Suture of the hole in the bladder.

i. Position of the patient.—The patient is placed in the reverse Trendelenburg position, a posture which greatly improves the access to the anterior vaginal wall. The patient lies prone upon the operating table with her legs from the groin downwards hanging over the end of the table. Her ankles are firmly held by an assistant on either side so as to keep the thighs flexed on the trunk. The table is now tilted so that the buttocks are elevated and the head depressed. It is essential

to keep the thighs flexed on the trunk, otherwise the patient slips down the table, and further, the thighs must be kept apart.

ii. Defining the vaginal flap.—A retractor having been inserted into the vagina and the posterior wall pulled back, a horseshoe-shaped

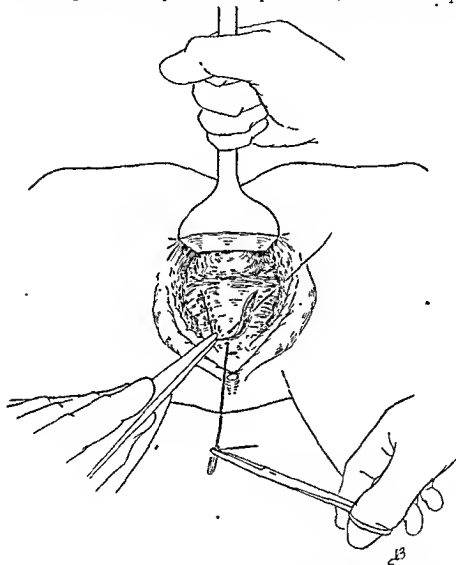


Fig. 112.—Suture of the flap after the hole in it has been cut away. incision, with its base uppermost, is made through the anterior vaginal wall with a scalpel, round the opening into the bladder and half an inch from it (Fig. 109).

iii. Reflecting the flap.—This piece of vaginal wall, delineated by the incision made, is dissected as a flap with a scalpel, well clear of the opening into the bladder, so as to separate the vaginal wall from the bladder base, which is now exposed (Fig. 110).

iv. Suturing the hole in the bladder.—A purse-string suture of 10-day catgut is passed through the muscular coat of the bladder base, and round the hole in the bladder, about a quarter of an inch from it, so that when the suture is tied the hole is closed and the edge is inverted into the bladder (Fig. 111). If the hole is too large for a purse-string suture, it must be closed by interrupted sutures. It is noteworthy that when the hole in the bladder mucosa is exposed it is always markedly larger than the size of opening into the vagina.

v. Suturing the vaginal flap.—The vaginal flap which has been reflected is now partly removed, the portion cut away including the opening of the fistula, and the remainder of the flap is pulled down and united to the cut edges of the original incision with interrupted silkworm-gut or silver wire (Fig. 112)

After-treatment.—See Chapter xxx. The treatment of the bladder is the same as that proper to the last-described operation.

ABDOMINAL OPERATIONS

Indications.—In certain cases one or more flap-splitting operations by the vaginal route will have failed to close a vesico-vaginal fistula, and, perhaps, as a result the fistula may have been made worse; or, owing to the narrowness of the vagina or the position of the fistula, it may be impossible to expose the fistula sufficiently to enable the operator to get at it, or it may be in such a position that there will be great danger of wounding one or other ureter when operating by the vagina. In such cases the fistula may be repaired by approaching it through the abdomen. In our opinion a great many vesico-vaginal fistulae will be best treated primarily by this route.

EXTRAVESICAL REPAIR

Preparation of the patient.—See p. 78. The urine must be free from pus, and all traces of cystitis must have disappeared.

Instruments.—See p. 274.

Operation. i. Abdominal incision.—The patient having been placed in the Trendelenburg position, the abdomen is opened in the middle line and an incision is made through the peritoneum covering the anterior surface of the uterus at the upper limit of loose attachment. This incision should extend from round ligament to round ligament, and it may be convenient to divide these if more room is required.

ii. Separation of the bladder.—The peritoneum is then detached from the front of the cervix and, the plane of cleavage between the cervix and the bladder being defined, the latter is separated in the manner described at p. 378, first from the cervix and then from the vagina.

iii. Closing the hole in the bladder and vagina.—To do this properly

the vagina must be fairly exposed and, if necessary, separated in the manner described under Wertheim's operation. The aperture in the bladder is thus separated from the aperture in the vagina, and each of them is separately sutured, that in the bladder with No. 0 10-day, and that in the vagina with No. 1 20-day catgut. To do this the bladder must be pulled well up by traction on the peritoneal flap. If the holes

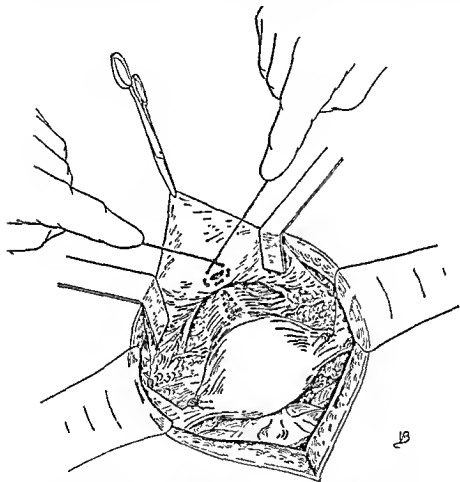


Fig. 113.—The trans-peritoneal operation for vesico-vaginal fistula : Closing the holes in the vagina and bladder.

are small, a purse-string suture should be employed ; if large, continuous sutures (Fig. 113).

iv. Suture of the peritoneal flap, round ligaments, and closure of the abdomen.—The bladder is now allowed to drop back on to the vagina, and the peritoneal flap and the round ligaments, if they have been divided, are sutured into position. The abdominal wound is then closed.

After-treatment.—A No. 12 rubber catheter should be fixed into the bladder by a suture through the catheter and the mucosa adjacent to the meatus, and the bladder drained by suction for a week.

INTRAVESICAL REPAIR

Preparation of the patient.—See p. 78.

Instruments.—See p. 274. In addition, a bladder syringe or an irrigating porringer, two retractors, a self-retaining catheter, and two pieces of india-rubber drainage-tube 3 inches long, one $\frac{3}{4}$ inch in diameter and the other $\frac{1}{4}$ inch, will be required.

The extraperitoneal operation. i. Washing out the bladder.—The catheter is inserted, and by means of the bladder syringe, or the irrigating porringer, the bladder is washed out with warm boric-acid solution until the solution returns quite clear.

ii. Filling the bladder.—The vagina is then plugged to stop the hole in the bladder so far as possible, if it is a large one; and then 10 to 20 oz. of the boric-acid solution are injected into the bladder, after which the catheter is clamped with a pressure forceps.

iii. Abdominal incision.—An incision 4 inches long, reaching upwards from the symphysis pubis, is then made in the middle line.

iv. Exposure of the bladder.—The index finger of the right hand is inserted into the wound, and with it the subperitoneal fat and peritoneum are displaced to the upper angle of the wound. The bladder will now protrude into the wound, and can be recognized by the large veins which will be seen coursing over its surface.

v. Opening the bladder.—The operator then opens the bladder 2 inches above the symphysis pubis, and the incision is enlarged to about 3 inches, care being taken to avoid, when possible, any vein. The solution will then run out of the bladder, and the vaginal plug must be removed.

vi. Exposure of the interior of the bladder.—The interior of the bladder is now exposed and the position of the fistula is determined by the help of deep retractors, aided by a couple of silk sutures, one passed through each cut edge of the bladder, by which means the bladder can be drawn up into the wound and a better exposure obtained.

vii. Excision of the edges of the fistula.—The edges of the fistula are now excised, the tissue removed including vesical mucous membrane, the muscular wall of the bladder, and vaginal mucous membrane.

viii. Closure of the hole in the vagina.—By means of very small needles held on long pressure forceps, interrupted catgut sutures, size No. 0, 20-day, are passed through the vaginal wall and tied.

ix. Closure of the hole in the bladder.—A similar series of interrupted sutures is passed through the mucous membrane and muscle of the bladder, along the margin of the hole. The sutures, when tied, close the vesical part of the fistula.

x. Suture of the incision in the bladder.—The incision in the bladder is now sutured with a continuous No. 1 plain catgut suture, a small

space being left at one angle for the insertion of the large drainage-tube. The suture should pierce all the walls of the bladder, and a useful method to employ is that of the Connell suture whereby the edges of the wound are inverted (*see* p. 36). A reinforcing layer of Lembert's sutures concludes the suturing of the bladder.

xi. Insertion of the drainage-tubes.—The large drainage-tube is inserted in the hole left in the bladder and secured there by a catgut suture passed through it and the muscle of the bladder, its end projecting an inch beyond the skin incision. A smaller tube is then inserted in the prevesical space and secured by a catgut suture. A catheter should now be passed along the urethra into the bladder and sutured there.

xii. Closing the abdominal incision.—*See* p. 286.

xiii. Dressing and after-treatment.—At the conclusion of the operation the wound is dressed with antiseptic gauze and thick layers of cotton-wool.

When the patient returns to the ward, a long, thin rubber tube is attached to the self-retaining catheter and its free end is attached to a continuous aspirating apparatus.

The bladder is washed out twice daily through the supra-pubic opening with boric-acid solution, and in 4 or 5 days the large drainage-tube is removed, after which the bladder can be irrigated through the wound.

At the end of a week the small drainage-tube can be removed from the prevesical space and the self-retaining catheter should be removed.

Otherwise the after-treatment is the same as for other abdominal operations (*see* Chapter xxx).

Dangers and difficulties.—The chief difficulty in the operation is concerned mostly with not having the proper instruments. The operation can be done with an overhead light, with small intestine needles and the ordinary forceps used in abdominal operations, but it is much easier and can be more successfully accomplished with a head-lamp and the special instruments and needles that have been devised for bladder-work.

The intraperitoneal operation.—When all traces of cystitis have disappeared, access to the bladder may be obtained through the peritoneal cavity. The advantage of this route is that it allows a much larger opening in the bladder, and the surgeon is much better able to see and reach the fistula.

The patient should be in the Trendelenburg position with the intestines carefully packed off. A middle-line incision through the abdominal wall is made, and the bladder is opened through its posterior peritoneum-covered surface. A preliminary distension of the bladder is not required, an important advantage if the fistula be a large one. For

the rest, the closure of the fistula is carried out as already described, and, this done, the bladder is sutured in the manner described on p. 163, without any drainage, a catheter being fixed into it *per urethram* and subjected to continuous suction.

If the urine cannot be made aseptic the extraperitoneal operation should be employed, though the chance that the sutures closing the fistula will effect their purpose is dubious with infected urine.

URETERO-COLIC IMPLANTATION

In cases of vesico-vaginal fistula in which repeated operations have failed to close the deficiency in the bladder, or when at the outset the opening is so large, so surrounded by scar tissue or so disadvantageously situated that it is obviously uncloseable (as in some post-operative fistulae and nearly all those produced by radium burns) implantation of the ureters into the colon is indicated. This operation, first performed by Peters and Lendon, was brought within the range of practicability by Stiles, and was subsequently improved upon by Grey Turner* and Coffey, the modern procedure being commonly known by the latter's name. The operation can be performed in two stages, first one and then the other ureter being implanted, but nowadays most surgeons perform it in one stage, as it is in the operations for excision of the bladder and pelvic exenteration that it is now most frequently employed, whereas when it was first introduced it was applied to cases of ectopia vesicæ only.

The one-stage operation.

i. Isolating the right ureter.—The patient having been placed in the Trendelenburg position and the abdomen opened, the right ureter is exposed by dividing the peritoneum over it and following it downwards to as near the bladder as possible without interfering with the uterine vessels or cardinal ligaments.

In the case of pelvic exenteration, exposure of the ureters is the first step in the operation, the ovario-pelvic ligaments being divided to that end (*see* p. 406).

ii. Preparing the ureter.—The ureter is divided as low down as possible and its distal end ligatured with catgut. The proximal end is now cut obliquely like the end of a goose-quill pen. A suture of 00 10-day gut is inserted through its pen-nib end and tied, so that two loose ends are left.

iii. Incising the colon.—Starting on the anterior longitudinal band, as low as can conveniently be reached, an incision is made through the peritoneum and muscle of the bowel, sloping obliquely upwards and to the right. It should be about $\frac{3}{4}$ inch long. The mucous membrane is then pulled up and a small opening made through it, as low as possible, which will just admit the ureter.

* *British Journal of Surgery*, 1929, Vol. XVII, No. 65.

iv. Fixing the ureter.—Fine needles are now attached to the loose ends of the catgut fixed to the ureter, and first one and then the other is passed through the hole in the bowel mucosa and brought out through the wall of the colon about half an inch below the incision, and separated from each other by about a quarter of an inch. These threads, being tied, draw the end of the ureter into the lumen of the bowel and securely fix it against its wall (Fig. 114).

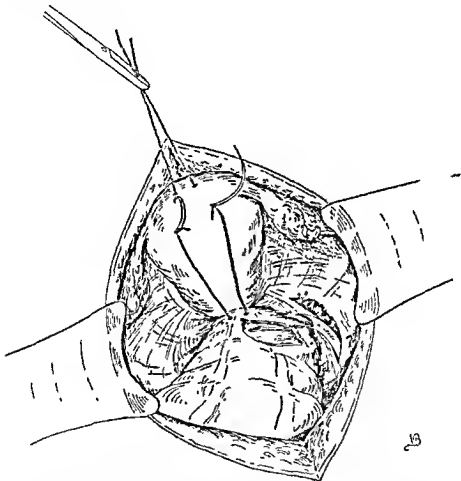


Fig. 114.—Uretero-colic implantation: Passing the sutures that fix the ureter in the colon. (After Grey Turner)

v. Burying the ureter.—If the hole in the mucosa is larger than necessary it is reduced in size by one or two catgut sutures. The ureter is buried by a row of fine interrupted catgut sutures passed Lembert-wise. The first begins just above the point where the fixation suture is tied, and the last just below the upper end of the incision in the peritoneal and muscular wall of the bowel. All except the lowermost of these sutures pick up the wall of the ureter, but *very superficially* to avoid ureteral constriction.

A second row of sutures can be inserted picking up only the peritoneum of the bowel so as to more effectually bury the ureter, but this practice has been largely given up, as it tends to ureteral constriction.

It is well, however, to tack the peritoneum over the ureter to the colon wall, so that it covers the area of grafting. Brunschwig deliberately

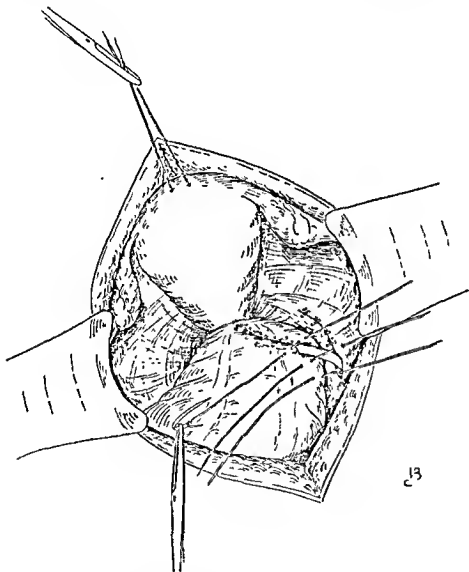


Fig. 115.—Burying the ureter. (After Grey Turner.)

tries to leave a strip of peritoneum attached to the ureter which can be used for this purpose.

A small rubber tube may be inserted down to the site of implantation as a precaution, and a large self-retaining rubber catheter (14) is placed in the rectum (Fig. 115).

Implantation of the second (left) ureter.—This is carried out in exactly the same way.

After treatment.—A glycerin enema is administered on the third day, after which the rectal tube may be taken out. The bowel empties itself very frequently to begin with, but later on the rectum acquires tolerance. During convalescence, penicillin, and later on one of the sulphonamides should be given. The amount of urine passed should be observed as accurately as possible, and if the quantity does not seem sufficient, or the blood urea estimation shows a sharp rise, saline glucose infusion should be started.

URETERO-VAGINAL FISTULA

A uretero-vaginal fistula is most commonly met with as a result of the radical operation for cancer of the cervix (*see* p. 382). It also sometimes follows simple total hysterectomy either by the abdominal or the vaginal route. Much more rarely it is the result of extensive laceration during labour. In these cases a deep lateral split of the cervix is present, running into the vaginal vault. The fistula opens into the split.

Spontaneous closure may occur even so late as 2 years after the operation or labour, and in post-operative cases it is advisable, as a rule, to wait for this event, though each case must be judged on its own merits. This much is certain, that a reparative operation should not be undertaken until all traces of sepsis, either in the bladder or in the parts adjacent to the leaking ureter, have disappeared.

The technique of uretero-vesical anastomosis is described at p. 748. It applies both to those cases in which the ureter is grafted in the course of the operation during which it was severed, and to those in which it is performed later for the cure of a fistula.

The proceeding is simplest in the first group, for in the second the cut end of the conduit usually lies in a dense mass of scar tissue from which it will have to be dissected out. Our experience of this latter group shows that in nearly all the cases the ureter is dilated above the fistulous communication with the vagina, which is situated about an inch from the bladder. This is an operative advantage, because it is easier to dissect out and graft the ureter when it is dilated than when it is of normal size.

Before operating, the surgeon must, if possible, make sure which ureter is at fault. For this purpose he should cystoscope the bladder and pass a catheter through each ureteral orifice. We have found, however, that when the patient has previously undergone the radical operation for carcinoma of the cervix this may be a proceeding of much difficulty, owing to displacement of the bladder and distortion of the ureters.

In the event of satisfactory information not being obtainable this way, it may be possible to draw a correct inference from the position of the opening in the vaginal vault, or from an X-ray photograph after the intravenous injection of one of the substances of the uroselectan type.

Failing this, the exact state of affairs will have to be discovered during the operation.

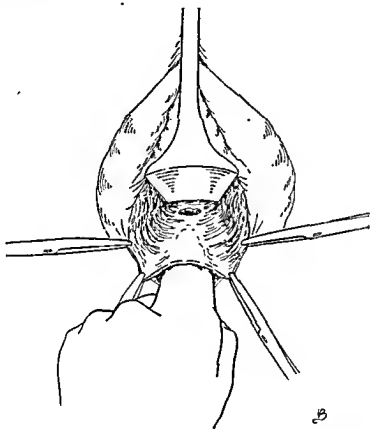


Fig. 116.—Closure of a recto-vaginal fistula: Separating the vaginal from the rectal wall.

The abdominal incision should always be a middle-line one, for this reason: after the abdomen is opened, each ureter should be investigated where it crosses the pelvic brim; if one is found dilated, the fistula almost surely belongs to that side. Further, at the seat of the fistula an indurated mass can usually be felt.

The technique of exposing and isolating the ureter is similar to that employed in Wertheim's operation (p. 380). Having isolated it, the surgeon should proceed to graft it in the manner detailed at p. 777.

The operation is a delicate one in all cases, and when many adhesions and dense induration are present it is, in addition, very difficult, but in our hands it has been very successful. In exceptional cases it may

pressure forceps, dissecting forceps, four half-circle needles No. 11, catgut No. 1, Reverdin's needle.

Operation.—The method of treating this condition depends on the position of the fistulous opening.

If the fistula is near the anus, it is best to cut through the perineum into the rectum, so that the local condition becomes that of complete

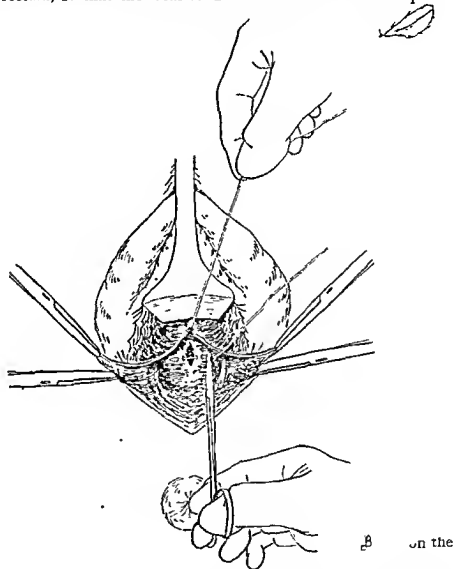


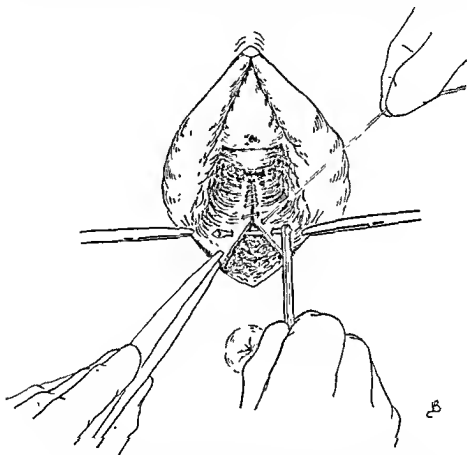
Fig. 118.—Suturing the hole in the rectum. The position is now

rupture of the perineum. The wound is now closed by the vaginal wall described at p. 527. This divides the cellular

Occasionally a fistula lies right in the middle of Douglas. The index finger is inserted through which case it may communicate with the vagina and is displaced a little. The closure of a fistula in such a case is done by the tissue at the bottom of the fistula either from the vagina or through

preliminary, and temporary, colostomy is advisable. This applies also to very large recto-vaginal fistulæ whatever their position, especially when the tissue bounding the fistula is indurated and rigid, as it always is when the fistula has been caused by the use of radium. Some of these operations are exceedingly difficult and may require to be repeated several times before the fistulous opening is completely closed.

If the fistula occupies a position between these two extremes, probably the best result will be obtained by dissecting up the posterior



119.—Suturing the vaginal wall after trimming away the hole in it.

wall beyond the opening and removing that portion which is very occasionally closing the hole in the rectum with separate sutures bladder, if the kidney constricting the cut edges of the vagina in the tional, which in the vast majority of cases po-perineorrhaphy (p. 514).

RECTO-VAGINAL anterior vaginal wall.—This is carried
Preparation of the patient.—See *Perineorrhaphy* (see p. 514). The finger
Instruments.—Vaginal retractor, wall up to well above the fistula,

after which the vaginal wall is split in the middle line the full length of the separation (Figs. 116, 117).

ii. Suturing the rectum.—A series of catgut Lembert sutures is now inserted to close the hole in the rectum. They should include the muscular wall of the bowel but not the mucosa (Fig. 118).

iii.—The vagina is now sutured as described on p. 520, the operator repairing the perineum if it requires it (Fig. 119).

Dressing and after-treatment.—See Chapter xxx. The patient may get up in 3 weeks.

Remarks.—In some fistulae caused by radium so much of the rectal wall has been destroyed that only permanent colostomy will give relief.

COLPOTOMY

Indications.—This operation belongs for the most part to a bygone age, when it was considered the correct procedure to remove, or to try to remove, fibroid and ovarian tumours and diseased conditions of the Fallopian tubes by the vaginal route. This dangerous practice has very largely fallen into disuse, but occasionally cases are met in which it may be safer to operate by the vaginal route.

Colpotomy is indicated when a patient with a large pelvic abscess due to a suppurating hæmatocele, pelvic appendicitis or pyosalpinx, or the result of criminal abortion, is *in extremis* as a consequence of neglect to operate earlier. We have seen such cases, practically at the point of death and in whom an abdominal operation would certainly have been fatal, recover after vaginal drainage. Colpotomy can be completed in a few minutes, with gas and oxygen if necessary. Later on, when the patient has recovered, the abdomen may be opened and the organ at fault dealt with.

Preparation of the patient.—See p. 76.

Instruments.—Auvard's speculum, scalpel, scissors, volsellum, six pressure forceps, a ring forceps, No. 7 needles, plain catgut.

Operation. i. Exposure of the posterior fornix.—Auvard's speculum having been inserted, the posterior lip of the cervix is seized with a volsellum and drawn forwards, thus putting the posterior fornix on the stretch.

ii. Incising the posterior fornix.—With a scalpel an incision is now made in a transverse direction for 2 inches, just where the vaginal wall is reflected on to the posterior lip of the cervix. This divides the cellular tissue in the floor of the pouch of Douglas.

iii. Exposing the peritoneum.—The index finger is inserted through the incision and the cellular tissue is displaced a little.

iv. Division of the peritoneum.—The tissue at the bottom of the

wound is secured with pressure forceps close to the posterior wall of the uterus, and then divided with scissors.

v. Enlarging the opening.—A pair of closed ring-forceps is then passed into the abscess cavity, after which the forceps is partly opened and withdrawn, the opening in the peritoneum being thus safely enlarged.

vi. Securing the drainage-tube.—A drainage-tube, 1 inch in diameter, is secured in position with a No. 1 unfortified catgut suture passed through the tube and vaginal wall.

Dressing and after-treatment.—See Chapter xxx.

Dangers.—The only danger connected with this operation is that a piece of bowel in Douglas's pouch may be injured. Such an accident is not likely to occur if the above directions are carefully followed. In a case of double pyosalpinx there is a risk of leaving one Fallopian tube unopened and undrained so that, although a certain amount of pus is evacuated, the symptoms continue. The same applies to double ovarian abscess.

CHAPTER VIII

OPERATIONS ON THE CERVIX

ATRESIA OF THE CERVIX

THIS condition is usually the result of operations on the cervix, or of the application of strong caustics, such as nitric acid, to the interior of the uterus. Hæmatotrachelos is the result if any part of the cervix remains, the uterus forcing the menstrual blood into the cervix and distending it. When the whole cervix has been previously removed, or destroyed, the body of the uterus becomes distended, together with the Fallopian tubes, and all three will require removal.

For hæmatotrachelos the following operation will be sufficient :

Preparation of the patient.—See p. 76.

Instruments.—Auvard's speculum, volsellum, uterine sound, uterine dilators, scalpel, four half-circle needles No. 11, catgut No. 1, catheter.

Operation.—Auvard's speculum having been inserted into the vagina, the cervix, which is distended to the size of a tennis ball, is seized with two volsella and drawn down as far as possible ; an attempt may then be made to overcome the obstruction by passing a sound or the smallest uterine dilator. If this fails, the knife will have to be used to make a passage. After the fluid has been evacuated, the cervical canal should be dilated to No. 12, after which a drainage-tube is sewn in ; it is removed when the patient gets up, which is in about fourteen days.

Dangers.—In long-continued obstruction the Fallopian tubes become dilated and adherent to surrounding structures. In such a case it is better to perform salpingo-hysterectomy.

Dressing and after-treatment.—The general lines of after-treatment are described in Chapter xxx. The vagina should be douched three times a day.

DILATATION OF THE CERVIX

Indications.—This operation may be indicated in cases of dysmenorrhœa and sterility, for removing a myomatous, mucous or placental polypus of the uterus, for enucleating a submucous myoma, as a preliminary to curetting the uterus, insufflation of the tubes, amputation

of the cervix or insertion of radium, and as a means of diagnosis in cases of suspected cancer or other intra-uterine disease.

Preparation of the patient.—See p. 76.

Instruments.—A catheter, Auvar'd's speculum, uterine sound, two volsella, uterine dilators, one long pair of pressure forceps, one pair of narrow ring forceps, scissors, two curved needles No. 9, catgut No. 1.

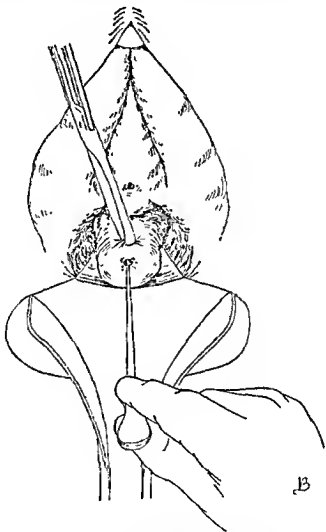


Fig. 120.—Dilatation of cervix: Passing the sound.

Operation. i. Examination of the position and mobility of the uterus.—Before the operation is commenced, the patient should be examined bimanually to ascertain the position and mobility of the uterus and the presence, or absence, of any disease of the Fallopian tubes or ovaries. The vulva and vagina are then swabbed with iodine, flavine, or violet-green.

ii. Passage of the dilators.—The speculum is inserted into the vaginal canal, after which the anterior lip of the cervix is secured with a volsellum. The uterus is thus steadied, and the sound is passed to confirm the position of the uterus noticed on bimanual examination and to ascertain its length (Fig. 120).

If the uterus cannot be sufficiently steadied with one volsellum, two may be applied to the anterior lip of the cervix, or the second can be applied to the posterior lip. In some cases in which the cervical tissue is soft, as after a recent miscarriage or labour, it is better to seize the anterior lip with a ring-forceps so as to avoid wounding the cervix and making an additional channel for possible infection.

The dilators, having been previously arranged in order, are now pushed up the cervical canal, commencing with the smallest instrument, unless from the appearance of the external os it is obvious that the dilatation can be started with a size larger than this.

It should here be remarked that the passage of a graduated dilator up the uterine canal is a manoeuvre least of all requiring mere muscular force. The operator should constantly have before him a mental picture of the shape, length, and direction of the uterine canal as previously determined by his bimanual examination and the passage of the sound. He is thus enabled to control and regulate the force he is using in accordance with the varying resistances the point of the dilator encounters at different parts of the uterine canal and, by correctly directing the instrument, he minimizes these resistances so far as is possible. The dilator should be held in the right hand, with the second, third, and fourth fingers slightly extended, so that if it slips, because of a too forcible manipulation or because the cervical tissues suddenly give, the finger-tips will impinge on the left buttock of the patient before the dilator has travelled any distance, and perforation of the uterine wall will thus be avoided. While the dilator is being passed, the operator or his assistant should not only hold the volsellum firmly with his left hand, thus steadying the uterus, but should assist the dilatation by pulling the cervix over the dilator (Fig. 121).

The amount of force to use in passing the dilators will depend on the condition of the cervix, and such knowledge can only be gained by practical experience. Nothing, however, approaching the full force the operator is capable of using is ever justifiable.

When the operator judges that the particular dilator he is using has been in position for a sufficient length of time, he directs his assistant to extract it, while he himself has the next largest dilator ready, so that it can be introduced at once, before the internal os has time to contract.

Amount of dilatation.—The amount of dilatation will vary with the object in view. When used for sterility, dysmenorrhœa, or as a preliminary to curettage of the uterus, a dilatation not exceeding

No. 9 Fenton will be found sufficient. For conditions, however, which require the introduction of a finger, such as the removal of retained products of conception, the digital exploration of the cavity of the uterus, or the removal of small submucous myomata, the dilatation must be carried to No. 18, or even larger.

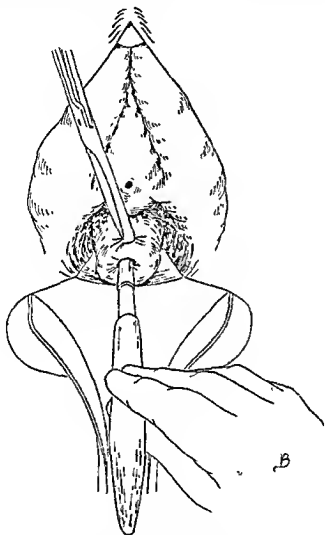


Fig. 121.—Passing the dilators.

Conclusion of the operation.—If the object of the operation is the cure of dysmenorrhœa, further steps are not usually taken beyond the dilatation already described.

Some operators, with a view to making more permanent the enlargement of the canal, insert a glass stem-pessary into the uterus for a week or 10 days. We do not do this, and we choose the day or two before the menstrual flow as the best time for the operation, not only because

dilatation is easier then, but because menstruation supervenes before the effects of the operation on the cervix can have passed off, and thus the efficacy of the operation is immediately put to the test. In a case of dysmenorrhoea in which the cervix is very small, it is often good practice to incise the external os laterally for a short distance into the cervical substance, after the dilatation is completed.

Only in the event of excessive bleeding from the dilated cervix do we plug the vagina with flavine gauze, which is withdrawn in 24 hours.

Dressing.—The vagina having been douched, a pack of gauze soaked in 1-in-1000 flavine should be inserted for 24 hours, if there is any undue bleeding. Generally this is not required.

After-treatment.—See Chapter xxx. The patient may get up in two or three days.

Difficulties.—The difficulties of dilatation may be described under four headings :

1. It may be impossible to introduce even the smallest dilator through the external os.
2. With a patent external os the passage of the internal os may be impossible.
3. With patency of the canal it may yet be impossible to increase the amount of dilatation beyond a certain point because of the rigidity of the cervical tissue.
4. As the dilatation is continued, the length of the dilator passing into the canal may get less and less.

1. If the obstruction is at the external os, and the sound itself will not pass, the direction of the passage should be ascertained by a fine probe, and the vaginal cervix should then be split bilaterally with a pair of fine-pointed scissors so as to open up the lower portion of the cervical canal, each part of the divided cervix being retracted. Any hæmorrhage from the incision can easily be controlled by suturing the split cervix after the dilatation is accomplished.

2. Difficulty at the internal os is often surmounted after the lateral incisions of the cervix, but when the stenosis at this point is very extreme, the use of the dilators must be led up to by the passage of fine probes.

3. If the cervix is rigid, increasing difficulty may be experienced in passing the dilators, and great patience must be exercised. If the dilators pass easily, there is no need to wait more than a few seconds before introducing the next size ; in cases of marked rigidity, however, it may be necessary to leave the dilator *in situ* for several minutes before introducing the next one. If on removing the dilator the internal os is found to grip the instrument very tightly, this is an indication that the dilator has not been left in long enough to relax the muscular spasm, and it should, therefore, be re-introduced.

The cervix of a virgin, or of a sterile married woman, is more rigid than that of one who has borne children. The cervix of a senile uterus is often very difficult to dilate. It may also be remembered that the cervix is particularly soft for 2 or 3 days preceding the period, and this is a good time to dilate it.

4. This difficulty is very common with beginners in gynæcological surgery, and has probably happened to everyone who has essayed the operation of dilatation of the cervix. What happens is this: The first few dilators are passed easily, which leads the operator to introduce the dilators more quickly than he should do. The lower part of the canal dilates more readily than the upper part, and the operator, unconscious of the fact, fails to notice that the distance to which each dilator is passed is successively diminishing. After a while this may become obvious to him, and he will have to retrace his steps and commence again with a dilator quite low down in the series. If he fails to recognize his error, however, he will mistake the dilated cervical canal for the uterus, and if the dilatation was a preliminary step to curettage he will curette the cervical endometrium and not the corporeal endometrium.

Dangers.—The frequency with which dilatation of the cervix is performed, and the ease with which it is, in most cases, carried out, have caused the very definite risks associated with it to be overlooked, especially by those who have but small experience in this class of surgery. There are few operations which entail such a responsibility on the gynæcologist as a difficult dilatation of the cervix. The operation is usually carried out for a condition not in the least dangerous to life, and yet its careless performance may result in disasters of the first magnitude.

COMPLICATIONS

The following complications have often occurred:

i. **Lacerated cervix.**—Putting aside those conditions in which the cervix is very soft, as just after a miscarriage, it is probable that nearly always when the cervix is dilated above Fenton No. 12 there is a certain amount of laceration of cervical tissue in the neighbourhood of the internal os. Those who state that it need not occur if proper care be taken, speak without sufficient evidence. At any rate, whenever the dilatation is sufficient to admit a finger, fibres of the cervix will be found lacerated, in many cases to a much greater extent than the operator would have suspected. Again, it is well known that in most cases dilatation is more difficult up to No. 9 than afterwards. This is said to be due to the resistance of the internal os, which later on is stated to 'give,' although what really happens is that its fibres are ruptured. Lacerations such as these do not constitute an appreciable danger.

Sometimes, however, owing to rigidity of the cervix, or to excessive

force being used, the cervical tissue is badly lacerated. The laceration may run into the vaginal vault from the external os, or it may commence in the neighbourhood of the internal os, so that, the points of succeeding dilators catching in it, the laceration is gradually enlarged until the uterus is perforated into the broad ligament.

A bad laceration may be suspected if, when there has been any difficulty in dilatation, the instrument suddenly, and without warning, slips in very easily. In many cases the cervical tissue can be felt to tear.

The risks of laceration are bleeding and sepsis. *Bleeding*, unless from some considerable artery, can be controlled by plugging the vagina with flavine gauze. If this fails, the measures enumerated under the heading of rupture of the uterine artery must be applied. *Sepsis* can be prevented, or minimized, by strict asepsis during the operation and antisepsis afterwards.

ii. Rupture of a branch of the uterine artery.—This rarely occurs. When it does, there is no difficulty in recognizing the fact, the bleeding being very brisk, and arterial in character. It is caused by laceration of cervical vessels. If the laceration runs up from the external os, it may be possible to see the bleeding spot, in which case it can be seized with forceps and secured by a mattress-suture. If the bleeding spot cannot be identified, owing to the laceration being limited to the upper part of the cervical canal, the vaginal cervix on the bleeding side should be split laterally, the full extent of the laceration exposed, and the bleeding vessel secured as before. Short of this, the bleeding vessel may sometimes be controlled by a pair of ring forceps clamped on the vaginal vault, one blade passed up the cervical canal, and the other applied outside it. If none of these methods is sufficient to arrest the bleeding, the uterine artery of the damaged side will have to be exposed and tied in the base of the broad ligament by the method described under Vaginal Hysterectomy, or if the narrowness of the vagina renders this difficult, then the abdomen must be opened and the artery secured from above.

iii. Late bleeding.—Very rarely, about the 10th day, profuse hæmorrhage may take place from the uterus. The source of this is an unsuspected laceration of the cervix or uterine wall, exposing a large vessel which subsequently gives way. If the bleeding recurs after the vagina has been plugged for 48 hours, the abdomen should be opened and the uterine arteries tied or the uterus removed.

iv. Perforation of the uterus.—The perforation may be through the uterus into the peritoneal cavity, into the broad ligament of either side or through the anterior wall posterior to the bladder. The accident may be due to inexperience on the part of the operator, but when the wall of the uterus is abnormally soft, it may happen even with the most expert. When dilating the cervix, not only should undue force not

be used, but the position of the uterus should be very carefully determined, since, with the uterus displaced backwards or anteflexed, perforation would be likely to occur if the operator was unaware of the malposition. The dilator should be held in the manner indicated in Fig. 121, and not in the closed hand, for if held properly it is more difficult to employ excessive force, and the extended fingers are ready to act as a brake. Excessive force should be avoided, because the tissue surrounding the internal os may suddenly lacerate and allow the dilator to rush on, and so perforate the uterus. The operator should remember that in cases of retained gestational products or vesicular mole, of senility, of superinvolution, and of cancer of the body, the uterine wall is apt to be so soft that very slight pressure against it with the point of a dilator may cause perforation. It sometimes happens that when dilating the cervical canal in a case of cancer of the cervix, preparatory to inserting radium into the uterus, it is difficult to find the canal, or, having found it, to keep the point of the dilator in it, since the cancerous cervix may be very soft and the point of the dilator may easily perforate the uterus into the broad ligament or posterior to the bladder. Lastly, in rare cases, the uterine wall may be very soft apart from any condition which would make one suspicious, and it is in such cases that perforation cannot be entirely guarded against.

Perforation into the peritoneal cavity may be suspected if a dilator suddenly slips in much farther than the one that preceded it. There is no doubt that in some cases the uterine body stretches during dilatation, and therefore a dilator may pass farther than the one preceding it; this stretching, however, is only slight, so that if a dilator passes markedly farther than the sound which indicated the length of the uterine canal, perforation may be diagnosed. To confirm this, the dilator should be immediately withdrawn, and the cavity carefully examined with the uterine sound, when, if the accident has occurred, the perforation will soon be detected.

Results of perforation.—Fortunately, owing to the aseptic surroundings in which dilatation should be carried out at the present day, perforation of the uterus, as a rule, does not cause any bad symptoms. If, however, the cervix is being dilated for some septic condition, such as in certain cases of retained gestational products, sloughing myomata, or cancer, the patient may die from peritonitis. Rarely, severe hæmorrhage into the peritoneal cavity may be caused. Perhaps the most serious result possible is the escape of an irritant douche solution into the peritoneal cavity through a perforation in the uterus of which the surgeon is unaware.

There are cases on record in which the uterus has been perforated during dilatation for the removal of retained secundines, and a piece of bowel has prolapsed through the rent; in one, the operator pulled down and cut off 6 inches of bowel before he became aware of his

mistake. In this case the abdomen was opened and the divided ends of the bowel were sutured with a successful result.

If the uterus is perforated, the action of the operator must be guided by circumstances. If an intra-uterine douche has not been given subsequent to the perforation, the operation should be abandoned and the vagina packed with flavine gauze, and a careful watch kept for signs of internal hæmorrhage or peritonitis. If, however, an intra-uterine douche has unwittingly been given subsequent to the perforation, the abdomen must be at once opened, for it is almost certain that some of the douche solution will have passed into the peritoneal cavity.

Hæmorrhage after perforation.—In the case of hæmorrhage it is noticed, when the patient recovers from the anæsthetic, that the pulse-rate is much faster than is usual after a simple dilatation, and the patient complains of severe abdominal pain, a symptom which is never present in a normal case. She is pallid, cold, and restless, and examination of the abdomen, even at this early period, discloses much suprapubic rigidity. Symptoms such as these indicate immediate exploration of the pelvis through an abdominal incision, and the perforation, having been located, must, if possible, be sutured. In cases, however, in which the laceration is very extensive and the hæmorrhage uncontrollable by sutures, the uterus should be removed, preferably by the sub-total method. Finally, if the cavity of the perforated organ is known to be septic or carcinomatous, the treatment offering the best chance to the patient is a total hysterectomy, the vagina being left wide open into the pelvis to secure free drainage.

Peritonitis after perforation.—After perforation, peritonitis may arise in three ways:

1. Direct infection of the pelvis by organisms from the interior of the uterus
2. The presence of blood in the peritoneal cavity, not sufficient, perhaps, to give rise to the classical signs of internal hæmorrhage.
3. Escape of a douching solution through the perforation.

1. In the case of direct conveyance of sepsis from the uterus to the peritoneum, the symptoms do not appear for at least 12 hours after the operation, and then present the ordinary characters of peritonitis, local or general, as the case may be.

2. In peritonitis due to hæmorrhage into the peritoneal cavity, signs of peritoneal irritation are present from the time the patient recovers from the anæsthetic, and steadily increase for the next 24 hours. The physical signs are those of a pelvic hæmatocele.

3. The introduction of irritant douche solutions into the pelvis gives rise to immediate and very violent symptoms. In particular, if a mercurial solution has been used, the patient is in great pain, the

pulse-rate is very fast, the lower abdomen soon becomes distended and rigid, and in about 4 hours a violent diarrhoea begins.

The *treatment* of peritonitis following perforation of the uterus will depend upon the knowledge the operator has of the cause and of the degree of the symptoms exhibited. When the introduction of an irritant douche solution can be excluded and the symptoms are not fulminant, it is best to wait, for in many cases the peritoneal reaction remains local, and after some days the pain and fever subside. If, however, it is known or strongly suspected that a poisonous solution has escaped into the pelvis, or if early and rapidly augmenting symptoms should present themselves, the abdomen should be opened, the rent sutured, and the pelvis mopped and drained through the abdominal wound. In these cases it is bad practice to remove the uterus, since the infection of the peritoneum has already occurred, and the operation, besides increasing the shock, opens up large areas of healthy tissue to infection.

Prolapsed intestine.—If the bowel has prolapsed through a uterine rent, the proper treatment is immediately to open the abdomen, carefully pull out the bowel, clean it if healthy, and resect it if damaged. The rent in the uterus is then to be sewn up, or the organ removed, as seems most advisable at the time. *On no account should the intestine be merely returned through the rent and the uterus plugged with gauze,* since it almost always happens that the intestine has been pulled off its mesentery, in which case gangrene will result.

Perforation into the broad ligament.—Perforation into the broad ligament is caused in a somewhat different manner. Laceration of the cervix first takes place in the neighbourhood of the internal os without the operator being aware of the fact. The points of the succeeding dilators are then thrust into this laceration, and the uterine wall is gradually torn until the dilator slips through into the broad ligament. This occasions more bleeding than is usual, which leads to a digital examination and the discovery of the accident. The result may not be serious if the operation has been carried out under aseptic conditions and a large artery has not been torn across. On the other hand, a hæmatoma of the broad ligament may rapidly form, or at a later date the symptoms of pelvic cellulitis may manifest themselves.

When the hæmatoma is small, the only symptom is pain referred to that side, and within a short time a swelling can be felt in the broad ligament. In exceptional cases, however, the effusion of blood is very large, and, raising the peritoneum off the side wall of the pelvis, the blood mounts into the iliac fossa, or even into the loin. A hæmatoma of this magnitude gives rise to the usual signs of internal hæmorrhage, and a very definite swelling, the outer limits of which are dull on percussion, can generally be felt. We have noted, however, that in extremely rapid effusions of blood under the posterior parietal peritoneum, great intestinal distension occurs, due probably to interference

with the splanchnic nerves. Such distension may mask the tumour formed by the hæmatoma. A similar condition of affairs is seen in other varieties of retro-peritoneal hæmorrhage.

v. Rupture of adhesions.—The uterus may be fixed in a retroverted position by adhesions, the result of pelvic peritonitis. If on manual examination the uterus is found to be fixed, it behoves the operator, if he considers dilatation a necessity, to use every care. An attempt must not be made to free the uterus, and the dilators must be passed in with the points backwards. If the adhesions are torn a pelvic hæmatocele may result or even severe intraperitoneal hæmorrhage, in which case the abdomen will have to be opened and the bleeding-points secured.

vi. Rupture of a pyosalpinx.—If the operator diagnoses a distended tube, he should not essay dilatation of the cervix before it has been dealt with. The uterus will be fixed and any movement of it with the dilators may perhaps rupture a pyosalpinx. This is a most serious disaster, and may set up in a few hours a peritonitis which may prove fatal. Even supposing that the diseased tubes do not contain pus, the disturbance of the parts caused by the dilatation may accentuate any symptoms of salpingitis already present, or may light up anew one that is quiescent.

The above remarks apply also to ovarian abscess.

vii. Salpingitis.—As we have already said, salpingitis is sometimes present in a minor degree before the operation, and may be accentuated by the manipulations incident to its performance. More commonly, however, it is a direct result of the operation, and may be brought about in three ways:

1. If the cavity of the uterus be already infected, as, for instance, by latent gonorrhœa, there is a risk of the uterine secretion being forced into the Fallopian tube by the piston-like action of the dilator.

2. The cavity of the uterus may be infected by the instruments used, and this infection may subsequently spread to the Fallopian tube.

3. Subsequent to the operation, owing to some failure of asepsis in the after-treatment, organisms may ascend the genital canal and infect the Fallopian tube.

The symptoms in such cases are those of pelvic peritonitis. The time of onset of the disease varies; most of the cases occur within a fortnight of the operation, many of them within a few days. It is, however, to be remarked that endometritis set up by dilatation may be responsible for an attack of salpingitis many months later.

Treatment of salpingitis.—This is discussed under peritonitis.

viii. Peritonitis.—Of the several causes of peritonitis after dilatation, perforation of the uterus, extension from salpingitis, and rupture of adhesions or of a tubal or ovarian abscess have already been dealt with.

But the condition may also result from a direct extension of infection through the uterine lymphatics from a wound in its lining membrane:

Peritonitis following dilatation of the cervix is local to the pelvis, as a rule, but occasionally, when the organism is of a very virulent nature or the infection overwhelming in character, e.g. a ruptured acute pyosalpinx, it becomes rapidly generalized. The earlier the symptoms appear the graver is the outlook. In the worst cases a pelvic tumour cannot be felt. In those of a lesser severity, a mass lying behind, or around, the uterus can usually be felt within a few days. This swelling is a conglomerate consisting of an inflamed Fallopian tube, a mass of blood-clot or collection of pus, single or in association as the case may be, and surrounded by adherent intestines and thickened omentum.

Treatment of peritonitis.—The onset of peritonitis after dilatation is a serious disaster, and the proper course for the surgeon to pursue will be a matter of the greatest concern to him. The difficulty that presents itself is to decide whether the peritoneal cavity should be explored or not. Each case must be treated on its merits, and a general rule cannot be laid down. When the physical signs are entirely local, it is better to wait in the hope that the inflammation may subside. In this case, hot fomentations may be applied to the abdomen, penicillin or sulphonamide exhibited, and morphia given internally for the relief of the pain, while vaginal injections of some antiseptic solution at 110° F. often afford relief and favour absorption. If the symptoms increase, or there are unequivocal signs of pus-formation, the abdomen should be opened, the condition dealt with, and the pelvis drained. All cases presenting the signs of general peritonitis should be at once treated in the manner described at p. 842.

ix. Pelvic cellulitis.—This is due to direct spread of infection through a laceration of the cervix or body of the uterus, usually the former. The symptoms may begin any time within the first 3 weeks, most commonly, as after labour, in from 10 to 14 days. With a rise of pulse-rate and temperature, a tender swelling in the affected broad ligament is discovered. As a rule, the disease remains strictly local, and tends after about a week to get well. More rarely the swelling may extend up into the iliac fossa, or a definite abscess may form.

Occasionally these cases of pelvic cellulitis are further complicated by femoral thrombosis and/or severe signs of general sepsis.

Treatment of pelvic cellulitis.—Unless there is a definite collection of pus, the patient may be treated in a way similar to that indicated for slight local peritonitis.

If pus forms, it should be evacuated without delay by an incision through the vaginal wall, care being taken to avoid the ureter (*see* p. 847); a drainage-tube should afterwards be inserted.

x. Injury to the capsule of a myoma.—If the uterus contains a

submucous myoma, the point of a dilator may penetrate its capsule. In such an event evil results may not follow, but occasionally the tumour is gradually extruded through the rent, with much hæmorrhage and, usually, more or less severe symptoms and signs of sepsis. In other cases, acute septic changes may be set up in the tumour without extrusion. The dilatation of a myomatous uterus is, therefore, a proceeding associated with definite danger.

POZZI'S OPERATION FOR STERILITY

If dilatation of the cervix, the usual operation for sterility unassociated with any evidence of local disease, is not successful, the cervical canal may be enlarged permanently by Pozzi's method. We have had some successful results in our own practice.

The operation is performed as follows :

Preparation of the patient.—*See* p. 76.

Instruments.—A catheter, Auvard's speculum, two volsella, scalpel, scissors, dissecting forceps, six pressure forceps, curved needles No. 7, catgut 20-day No. 1, Reverdin's needle.

Operation. i. *Exposing the cervix.*—Auvard's speculum having been inserted, a volsellum is attached to each lip of the cervix, which is then drawn down to the vulva.

ii. *Lateral division of the cervix.*—The cervix is now divided on each side with scissors or a scalpel for about an inch.

iii. *Reducing the thickness of the cut edges.*—With a scalpel, a small wedge of tissue between the outer and inner surfaces of the cut edges is next removed along the whole length of the lateral division.

iv. *Suture of the cut edges.*—The four raw surfaces are now obliterated by sutures uniting the respective edges of the cut surfaces.

Dressing and after-treatment.—*See* Chapter xxx. The patient gets up on the 14th day.

CAUTERIZATION OF THE CERVIX

This is a successful treatment for certain cases of chronic cervical discharge when there is neither hypertrophy nor erosion of the cervix.

Preparation of the patient.—*See* p. 76.

Instruments.—A catheter, Auvard's speculum, two vaginal retractors, volsellum, cautery.

Operation.—The speculum and retractors having been inserted, the cervix is pulled down and very thoroughly burnt. The cautery should be plunged deep into the tissue so as to destroy the cervical glands.

Dangers.—Care must be taken not to burn the vaginal wall. It might be thought there was considerable risk of subsequent stenosis, but we have never known it to occur.

Dressing and after-treatment.—See Chapter xxx. The patient may get up in a week. She should be douched till all the slough has come away.

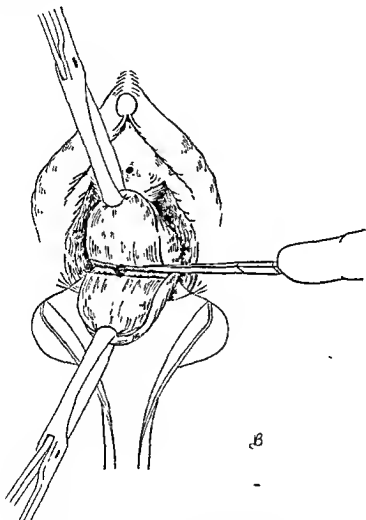


Fig. 122.—Trachelorrhaphy: Deepening the laceration.

TRACHELORRHAPHY

Indications.—This operation is performed for those cases of lacerated cervix in which the exposed surfaces of the laceration are covered, as the result of chronic cervicitis, with a redundant gland-bearing epithelium giving rise to a profuse leucorrhœal discharge. It has, however, the disadvantage that it leaves a strip of diseased mucosa in the restored cervical canal, and thus sometimes fails in its object of stopping discharge. It is not a good operation when much hypertrophy and elongation of the cervix exist, since it does not

remedy this condition. In such cases amputation of the vaginal cervix is preferable.

In those cases of repeated abortion in which a cause cannot be found other than that of the lacerated cervix, the operation of trachelorrhaphy has proved successful.

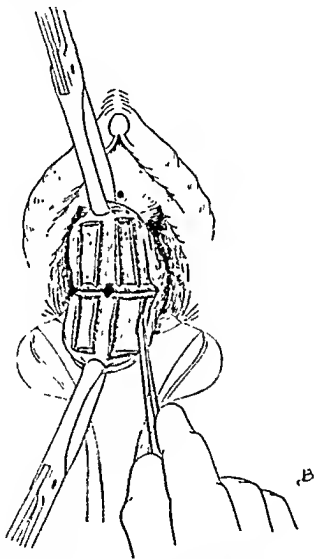


Fig. 123.—Demarcation of the areas of denudation.

Preparation of the patient.—See p. 76.

Instruments.—A catheter, Auvard's speculum, two volsella, dissecting forceps, four pairs of long pressure forceps, scalpel, uterine sound, Reverdin's needle, catgut 20-day No. 1.

Operation. 1. **Extension of the laceration.**—Auvard's speculum is inserted into the vaginal canal, and then, with a volsellum on the

anterior and posterior lips, the cervix is brought to the vulval orifice. The volsella are now separated so that the laceration is opened up as much as possible, the anterior volsellum being given to an assistant to hold. An incision is made across the cervix in the receding angle between the two separated lips, thus deliberately deepening the laceration (Fig. 122).

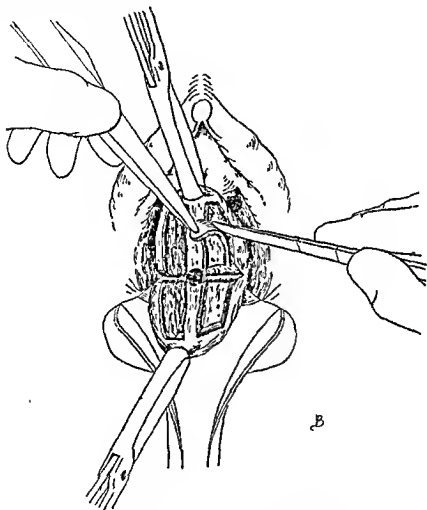


Fig. 124.—Denudation of the demarcated areas.

ii. Demarcation of the mucous membrane to be removed.—The surgeon proceeds to mark out with a scalpel on both lips of the cervix the limits of the pieces of mucous membrane he proposes to remove (Fig. 123). Four areas of mucous membrane are thus delineated.

iii. Excision of the areas of mucous membrane.—The delineated mucous membrane is then dissected off with a scalpel (Fig. 124). In dissecting off the mucous membrane, it must be remembered that a

narrow piece of this structure has to be left on each side of the middle line to form a lining for the cervical canal when it is remade; otherwise, as much mucous membrane must be dissected off as is possible, special care being taken completely to remove, with the mucous membrane,

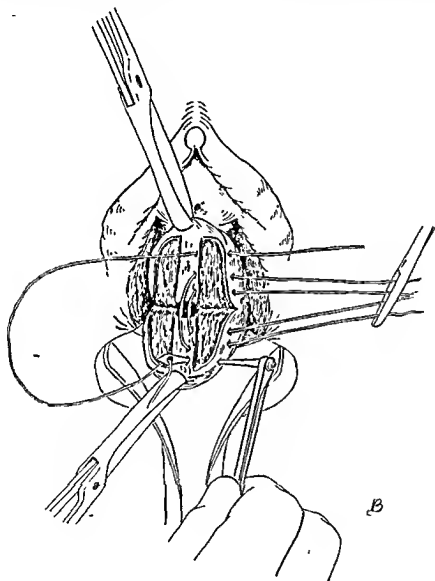


Fig. 125.—Introduction of the sutures.

the subjacent cicatricial tissue at the receding angle of the laceration. During the dissection of these flaps the bleeding may be rather free, but will, as a rule, stop when the raw surfaces are approximated. Should, however, the hæmorrhage obstruct the field of operation, it can usually be kept in check by an assistant directing a stream of hot water on to the cervix.

iv. Suture of the denuded surfaces.—The lacerated surfaces having been denuded, interrupted sutures of catgut—as a rule, three on each side will be sufficient—are passed by means of the Reverdin's needle. The needle is inserted in the anterior lip at the outer edge of the laceration close up to its receding angle. It is then carried through the cervical



Fig. 126.—Tying the sutures.

tissue deep to the raw surface, and brought out through the edge of the mucous membrane which has been left as a lining for the cervical canal, and the needle is withdrawn, bringing with it the suture. The needle is now re-introduced into the posterior lip through the outer edge of the laceration close to its receding angle, and is then carried through the cervical tissue, deep to the raw surface, and brought out through the edge of the mucous membrane which has been left as a

lining for the cervical canal. That end of the suture which has already been passed through the anterior lip of the cervix is now engaged with the end of the needle and withdrawn (Fig. 125), the ends of the suture being temporarily clamped. The remaining sutures are passed on each side in a similar manner.



Fig. 127.—Amputation of the cervix: Demarcation of the anterior flap.

v. Approximation of the split cervix.—By tying the respective sutures the raw surfaces of the cervix are now accurately approximated without any suture intervening between them which, acting as a foreign body, might prevent their union (Fig. 126).

The sutures having been tied, a sound is passed into the uterus to ensure that the cervical canal is patent.

Failures.—The failures of this operation are due, as a rule, to an insufficient amount of mucous membrane being removed, to the receding

angle of the laceration not being properly denuded, and to the too early absorption of the sutures.

Dressing and after-treatment.—See Chapter xxx. The patient gets up on the 12th or 14th day.



Fig. 128.—Reflection of the anterior flap.

AMPUTATION OF THE CERVIX

Indications.—This operation is performed for hypertrophic elongation of the cervix, congenital elongation of the cervix, and severe cases of laceration of the cervix with marked hypertrophy of the lacerated portion. Further, it is employed in certain cases of prolapse of the vaginal vault (inversion of the vagina) as a means of tautening it (*see*

p. 545). It is also indicated in cases of mucous discharge when associated with a severe erosion. It is further indicated in those cases of old-standing cervical erosion which, by reason of their tendency to bleed, their irregular red surface and indurated feel, suggest that the

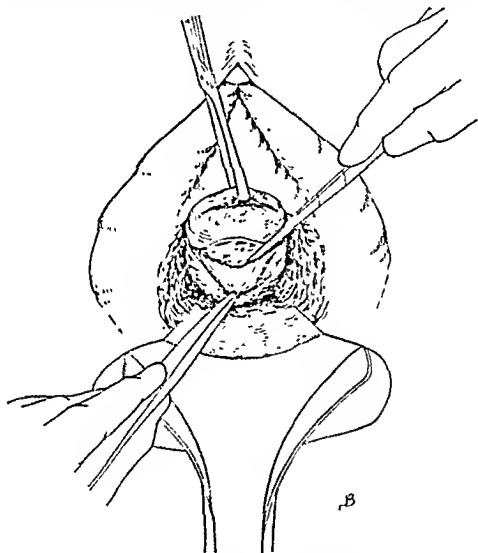


Fig. 129.—Reflection of the posterior flap.

condition may be the precursor of cancer. The operation about to be described is that originally devised by one of us.*

Preparation of the patient.—See p. 76.

Instruments.—A catheter, Auvar'd's speculum, uterine dilators 1 to 12, two volsella, vaginal retractors, six pairs of long pressure forceps,

* Victor Bonney, "The Technique of Amputation of the Vaginal Cervix," *Jour. of Obst. & Gyn. of Brit. Emp.*, Feb., 1913.

dissecting forceps, curette, uterine sound, bladder-sound, scalpel, Reverdin's needle, 20-day catgut No. 1.

Operation. i. Dilatation of the cervix.—Before commencing this operation it will be found very useful to dilate the cervical canal up to Fenton 12. This procedure greatly facilitates the introduction of the

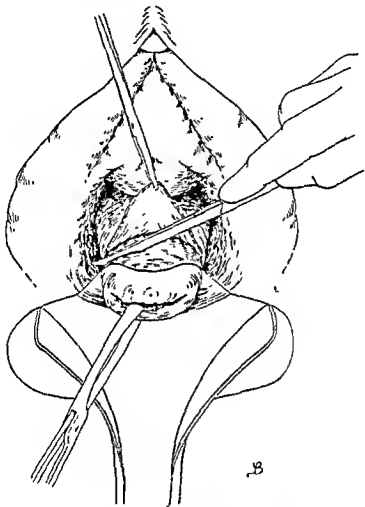


Fig. 130.—The amputation.

sutures from the cervical canal and also renders the covering-in of the raw surface easier. If the operation is being performed for inflammatory disease, the uterus should first be curetted.

ii. Identifying the limits of the bladder.—The bladder-sound is passed into the bladder to ascertain its extent, if there is any doubt on this point.

iii. Demarcation of the anterior flap.—An Auvard's speculum having

been inserted, the cervix is pulled down by a volsellum so that its vaginal portion and the supravaginal portion covered by the vaginal wall are well exposed. An incision is then made right across the anterior part of the cervix, through the mucous membrane down to the cellular tissue just above the erosion for which the cervix is being removed, or, in the

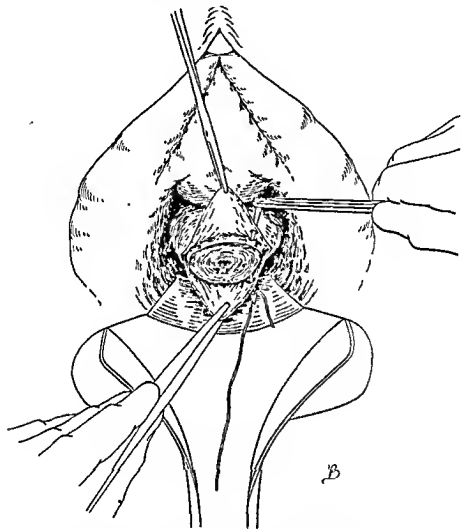


Fig. 131.—Passing the deep lateral sutures.

case of an hypertrophied cervix, at the junction of the vaginal cervix and the anterior vaginal vault (Fig. 127).

iv. Reflecting the anterior flap.—The centre of the cut edge of the anterior flap being held with dissecting forceps, the anterior flap is reflected off the cervix as far as the operator deems necessary (Fig. 128.)

v. Demarcation and reflection of the posterior flap.—An assistant having drawn the cervix up, the demarcation and reflection of the posterior flap is carried out in a way similar to that of the anterior flap (Fig. 129).

These flaps consist principally of mucous membrane, but their base may include some of the cervical muscle. The two flaps meet in a V-shape on each side at the point at which it is intended to amputate.

vi. Amputating the cervix.—The cervix is now amputated (Fig. 130). This may be effected by simple transverse incision or, if it is desired to

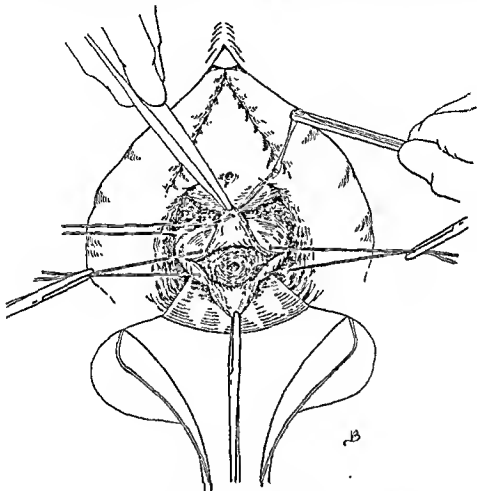


Fig. 132.—Passing the anterior approximating suture through the apex of the anterior flap.

remove the whole of the endometrium up to the internal os, a cone-shaped excision may be employed. There is considerable oozing, much of which will be arrested by the sutures, but obviously spouting vessels should be picked up, under-run with the needle, and ligatured.

vii. Passing the main lateral sutures.—The cut surface of the cervical stump is now well exposed by retracting the anterior and posterior flaps. On either side of the cervical canal a suture is now inserted deeply through the substance of the stump and through both anterior

and posterior flaps as follows: A Reverdin's needle is passed from before backwards through the anterior flap *close to its edge*, deeply through the tissue of the cervix and then through the posterior flap close to its edge. The suture of No. 1 20-day catgut is then withdrawn. These sutures should not be tied, but their ends left long and, by means

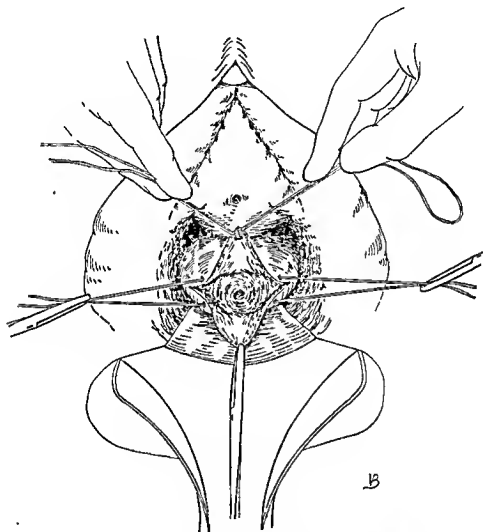


Fig. 133.—Tying the suture leaving a loop and two long ends.

of a pressure forceps attached to them, used as tractors to keep the stump in view (Fig. 131), thereby surmounting the chief difficulty of the operation: the height of the stump above the vaginal orifice.

viii. Passing the anterior approximating suture.—The apex of the anterior flap is secured by a double ligature (Fig. 132), so that when it is tied one end is looped and the other consists of the two free ends (Fig. 133).

The anterior flap having been pulled down, Reverdin's needle is now made to enter slightly above the base of the flap (Fig. 134) and passes through the cervical wall a little to the side of the middle line as far as the cervical canal; the anterior flap is drawn upwards and the needle made to emerge through the open end of the cut cervical canal.

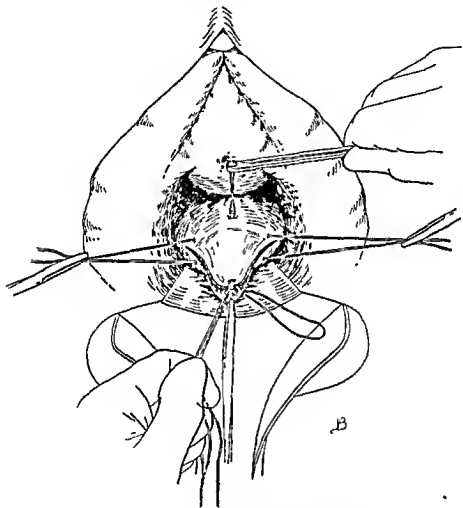


Fig. 134.—Entering the needle through the thickness of the cervix.

One of the free ends of the suture tied into the apex of the anterior flap is now placed in the eye of the needle (Fig. 135) and the needle is withdrawn and disengaged from the suture it brings with it.

After the end of the suture has been disengaged, the needle is passed in a similar way, a little to the opposite side of the middle line, and the remaining free end of the double suture having been placed in the eye of the needle, the latter is withdrawn and the suture disengaged.

It will now be found that, on pulling on the two free ends of the suture, the anterior flap is rolled over until its apex is approximated

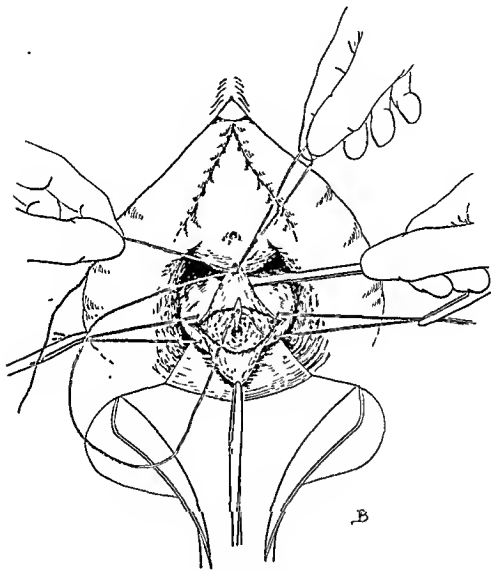


Fig. 135.—Withdrawing one of the long ends of the approximating suture.

to the mucous membrane lining the cervical canal, and, on tying them together, that it is fixed in that position (Fig. 136).

ix. The 'safety-bolt' suture.—The worst complication which is likely to follow amputation of the cervix by any method is that, within a few days following the operation, the stitches may give and serious bleeding result. This ligature has been devised to obviate, so far as possible, such an occurrence. It consists of tying the looped end of

the suture inserted in the apex of the anterior flap to the two free ends of this suture previously tied, thus making the ligature material form a complete circle, which compresses the anterior flap against the cut surface of the cervical stump (Fig. 137).

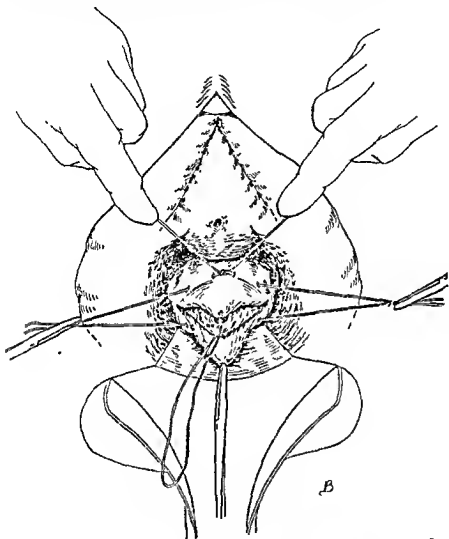


Fig. 136.—Tying the anterior approximating suture.

x. Passing the posterior approximating suture.—The posterior half of the cervical stump is treated in a way similar to that just described for covering the anterior half. This may be effected in exactly the same way as has been described. It is not easy in some cases, however, to pass Reverdin's needle into the cervical canal from behind forwards. The following modification of the technique will, therefore, be found to be better for this step of the operation.

The needle is inserted in the cervical canal and passed through the substance of the cervix to emerge on its posterior surface (Fig. 138). The needle is then withdrawn, bringing the thread with it, and then again inserted and brought out on the posterior surface, a little to one side of the first puncture. The posterior end of the ligature is then inserted into the eye of the needle and drawn back into the cervical canal.



Fig. 137.—Tying the loop to the long ends: the 'safety-bolt' suture.

A loop of ligature is left hanging from the posterior surface of the cervix and a pressure forceps is attached to the middle of this loop. The two free ends of the ligature are now passed through the apex of the posterior flap and a knot is tied, leaving two long ends. Traction is made on the loop behind, with the result that the apex of the posterior flap is approximated to the posterior margin of the cervical canal. The forceps on the loop is now taken off and, the loop being cut, the two components are then tied, thus fixing the approximating suture (Fig. 139). One of these components is then cut short and the other

is used to form the safety-bolt suture by tying it to the two long ends attached to the apex of the flap.

xi. Tying the main lateral sutures.—A gap now exists on each side of the new os and is closed by tying the lateral sutures already inserted (Fig. 140).

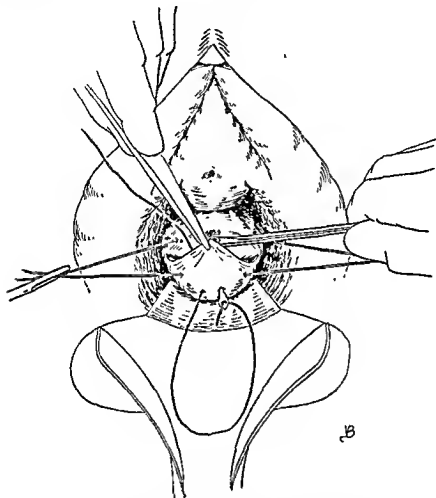


Fig. 138.—Passing the needle backwards through the cervix.

These lateral sutures are an essential part of the operation, because they ensure that a dead space is not left between the stump and the flaps. *Failure to carry out this important point in the technique may result in secondary hæmorrhage.*

Two further sutures are applied on each side, one at the external angle of the cut edges of the flaps (Fig. 141), and the other through the flap and cervical tissue between the safety-bolt sutures and the lateral sutures passed in the first instance (Fig. 142).

Dressing and after-treatment.—See Chapter xxx. The patient should be kept in bed for 17 days.

Difficulties and dangers.—The technique described makes amputation of the cervix a far easier and more satisfactory operation than it used

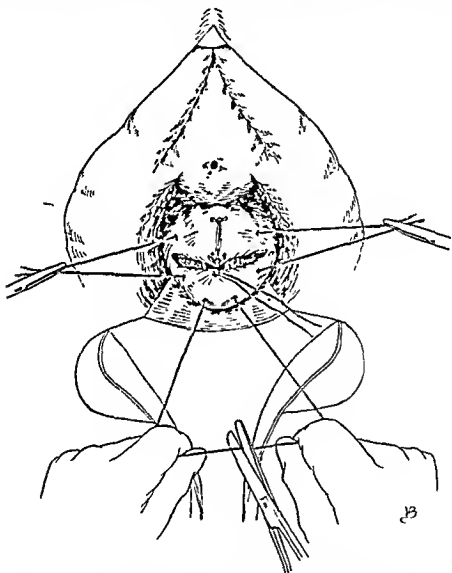


Fig. 139.—Cutting the loop of the posterior approximating suture.

to be. Stenosis of the new os is impossible because of the correct and firm approximation of the vaginal and cervical mucous membranes, and if the sutures are inserted as described there is complete control of the oozing which used to make this operation a very troublesome one.

As much or as little of the cervix may be removed as the operator desires, or the whole cervical canal can be coned out. In many cases of erosion it suffices to excise merely the thin film of tissue affected by the inflammatory process.

With a narrow vagina the operation is more difficult than is the case when that canal is capacious, but even then the difficulties disappear so soon as the lateral sutures are passed and become available as tractors.

The oozing is often very free, and no time should be lost in inserting these sutures, for until they are in position the bleeding will go on.



Fig. 140.—Tying the deep lateral sutures.

The chief danger of the operation is secondary hæmorrhage from premature yielding of the sutures; it usually occurs from the 7th to the 14th day. This may be very serious, and a blood transfusion has been found necessary. The cervical tissue appears to be particularly voracious of catgut, and suture material warranted to last 10 days under ordinary conditions is frequently found more or less entirely absorbed in a week. For this reason nothing less than 20-day No. 1 catgut should ever be used.

In the event of the secondary hæmorrhage, the best course, as a rule, is immediately to plug the vagina with gauze soaked in 1-in-1,000 flavine under an anæsthetic. If this fails, resuture is the only course (see p. 892).

CERVICO-VESICAL FISTULA

Preparation of the patient.—See p. 76. If cystitis exists it is absolutely necessary to cure it before attempting the operation.

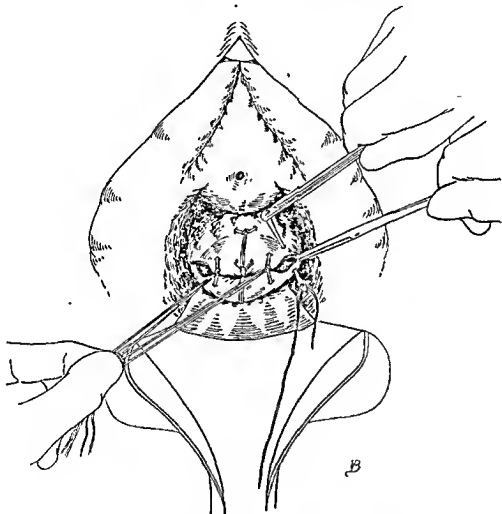


Fig. 141.—Insertion of additional sutures outside the deep lateral sutures.

Instruments.—Auvard's speculum, dissecting forceps, six pairs of long pressure forceps, volsellum, vaginal retractors, scalpel, scissors, two curved needles, two No. 7 and two half-circle No. 11, catgut No. 1, catheter, Reverdin's needle.

There are two varieties of this condition: (1) in which the fistula lies at the bottom of a deep laceration of the vaginal cervix; (2) in

which the communication is through the wall of the cervix some distance above the vaginal vault.

Operation.—In the first variety, the closure of the fistula should be combined with trachelorrhaphy. The edges of the vaginal mucous membrane which abut on the laceration must be undermined and retracted sufficiently to obtain a clear view of the opening in the

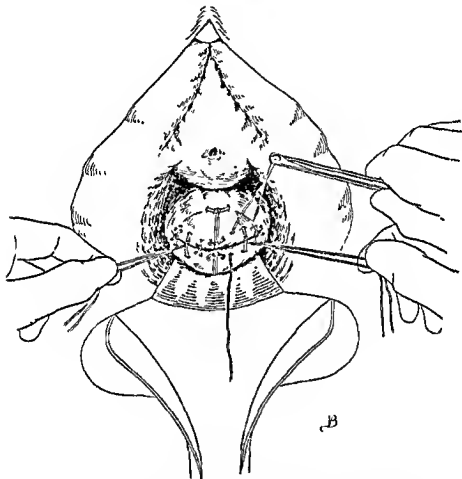


Fig. 142.—Insertion of additional sutures inside the deep lateral sutures.

bladder-wall. The bladder-wall is separated for half an inch around the opening, and the aperture is closed with a purse-string suture by preference. The edges of the vaginal mucous membrane and the cervical laceration are pared, and a series of sutures is inserted, beginning at the end of the laceration where it encroaches on the vaginal vault, and continued downwards as far as the external os, thus closing the vaginal mucous membrane over the aperture in the bladder and restoring the integrity of the vaginal cervix.

In the second variety two methods are available. By the first the bladder is turned entirely off the supravaginal cervix, following the technique of the first step of vaginal hysterectomy (p. 245), and the bole in it is separately closed by a purse-string catgut suture. The vaginal cervix is now pulled well down, and the perforation on its anterior wall freshened and closed with catgut sutures. Finally, the cut mucous membrane of the anterior vaginal fornix is united by catgut sutures.

By the second method the separation of the bladder from the cervix is effected through an abdominal incision in the same manner as is described under vesico-vaginal fistula (*see* p. 161). The peritoneum at the bottom of the utero-vesical pouch is divided transversely and, the bladder being defined, it is dissected off the cervix until the fistula is freely exposed.

The bole in the bladder is now closed by catgut sutures, and then the bole in the cervix is similarly dealt with. Finally, the peritoneum is sewn up across the utero-vesical pouch. In a difficult case, further room is obtained by dividing the round ligaments at each outer extremity of the peritoneal incision.

Dressing and after-treatment.—*See* Chapter xxx. The bladder should be kept empty by continuous suction. If catgut sutures have been inserted through the vagina there is no necessity to remove them, but if silkworm-gut has been employed they will need to be removed under an anæsthetic. The patient may get up in 14 days if the vaginal route has been chosen, and in from 16 to 21 days if the operation has been abdominal.

UTERO-VESICAL FISTULA

This complication is very rare. It must be dealt with by an abdominal operation. The bladder should be separated from the uterus, and the openings in both organs carefully closed with catgut sutures.

CHAPTER IX

OPERATIONS, ON THE CAVITY OF THE UTERUS

CURETTING

General remarks and indications.—Experience shows that inflammatory disease of the cervix, *and cervix only*, is extremely common in parous women, and not uncommon in virgins as well, while a corresponding condition of the corporeal endometrium is comparatively rare. Many of the changes that used to be described as inflammatory are now known to be caused by endocrine disturbance. The only symptom of chronic cervicitis is a mucous discharge, and on examination of the cervix an erosion, which is its outward visible sign, will nearly always be found.

Corporeal endometritis does not cause a mucous discharge, although nearly always associated with it because of the co-existent cervicitis. The secretion of the corporeal glands is a watery, not a mucous fluid. This is extremely well seen when a great overgrowth of the corporeal endometrium co-exists with a healthy cervix. Such a condition occurs in some cases of uterine myomata, a leading feature then being a copious watery discharge from the uterus. When this watery discharge is not present there is certainly not any hypertrophy of the endometrium, inflammatory or otherwise.

The other symptoms associated with corporeal endometritis are excessive menstrual hæmorrhage or irregular losses between the periods, but as such bleeding often depends on diseased conditions of the deeper parts of the uterine wall or endocrine disturbance, it is not pathognomonic of changes in the endometrium.

The corporeal endometrium is the softest lining membrane in the body; it is succulent and thick, and strips off readily with the curette. The cervical endometrium, on the other hand, can scarcely be described as a "membrane" at all. It consists of a surface layer of short columnar cells standing almost directly on the subjacent muscle in which, most deeply embedded, are the racemose mucus-producing cervical glands. The healthy vagina contains many organisms, and their passage up the cervical canal is unimpeded. Such organisms, however, do not find their way beyond the internal os. In pathological infections of the vagina (e.g. by the gonococcus) the same holds true, as a rule. Gonococcal endocervicitis is constantly present, while gonococcal endometritis is fortunately comparatively rare.

A want of appreciation of these facts of anatomy and pathology results in the curette being so frequently used in inappropriate conditions. Thus the corporeal endometrium is constantly being tipped off by the blunt curette when the cervix alone is at fault, while the diseased cervical glands, the sole origin of the discharge, are left uninterfered with because nothing less than a *sharp scoop or the actual cautery*, strongly applied, suffices to eradicate them from the dense matrix by which they are surrounded. In many of the patients who require curetting, it is the cervical endometrium alone which should be eradicated.

To sum up, leucorrhœa *per se* is an indication for curettage of the cervix only. Abnormal hæmorrhage, pain, and uterine enlargement, though they may indicate corporeal endometritis, are very often due to some altered condition of the deeper parts of the uterine wall, or to endocrine imbalance, which a superficial denudation of the mucosa will not cure.

The operation of curetting the endometrium of the uterus may be required for chronic endometritis, mucous polypus, retained products of conception, membranous dysmenorrhœa, and to obtain a piece of the lining membrane for microscopical examination.

Preparation of the patient.—See p. 76.

Instruments.—Those for dilatation (p. 176), and in addition a blunt flushing curette, a sharp scoop, and a narrow ring forceps.

Operation. i. Dilatation of the cervix.—The cervix is dilated with all the precautions mentioned under the description of that operation (p. 176). The extent of dilatation depends on the condition to be dealt with. If a digital examination of the uterine cavity is not intended, a dilatation up to No. 12 Fenton will suffice.

ii. Palpating on the dilator.—Before pulling out the last dilator he proposes to employ, the surgeon should prise the uterus forward and upward by it, and then, with his left hand, palpate the organ through the abdominal wall. The dilator renders it very tangible. By this means fibroids and other masses can be felt which otherwise would escape detection (Fig. 143).

iii. Curetting.—The dilator is then withdrawn and the curette is carefully inserted through the cervical canal into the uterine cavity, the flow of the douche solution being temporarily stopped. Opportunity is now taken carefully to sound the cavity in order to ascertain that a perforation does not exist, for in this event the introduction of an injurious chemical solution into the peritoneal cavity will convert what is usually only an untoward accident into a serious disaster. A solution of flavine, 1 in 1,000, at a temperature of 115° F., will be found the best

(Fig. 144), and drawn firmly, evenly, and systematically from above downwards over the posterior uterine wall, then over the anterior wall, and then laterally, special attention being paid to the two cornua, as diseased tissue in this situation is likely to be missed.

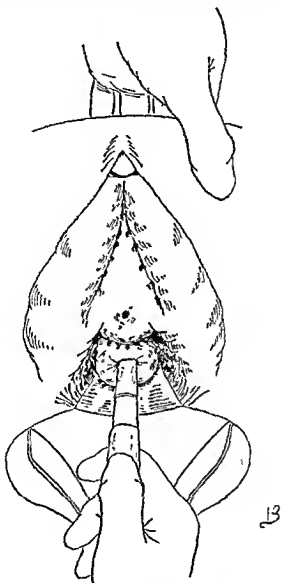


Fig. 143.—Palpating on the dilator.

Very little force is to be used ; and the curettage is continued until a grating, heard or felt, indicates that the musculature is reached. A small ring forceps should now be inserted for the purpose of ensuring that a polypus has not been missed by the curette, which is an accident

likely to occur if this precaution is not taken (Fig. 145). The operator then takes a sharp scoop and vigorously scrapes the wall of the cervical canal and the erosion that surrounds the external os, if there is endocervicitis as well.

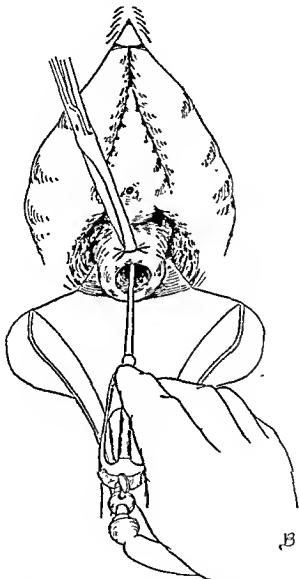


Fig. 144.—Curetting : Applying the curette.

When evidence of corporeal disease is wanting, the mucosa of the body should not be interfered with, and the cervix alone should be scraped.

Dangers.—The dangers of curetting are (i) sepsis, (ii) hæmorrhage, and (iii) perforation of the uterus.

i. Sepsis.—See pp. 182–186.

ii. *Hæmorrhage*.—Sometimes after curetting the body of the uterus the bleeding is very free, especially after the evacuation of products of pregnancy, and, if not dealt with, becomes dangerous. If this bleeding is not due to rupture of a large artery or grave laceration of the uterus,

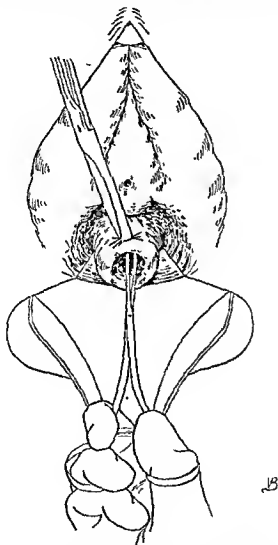


Fig. 145.—Exploring the uterus with ring-forceps.

it can be arrested by packing the vagina with gauze soaked in flavine, 1 in 1,000.

It occasionally happens that severe hæmorrhage will take place some days after a curetting, and if so it must be treated on similar lines. We remember a case in which on two occasions, 11 and 14 days after a simple curetting, the patient, who had convalesced with a perfectly normal temperature, had such severe and sudden hæmorrhage that on

both occasions she nearly died. No cause was ever discovered for this complication, but it was probably due to the fact that the uterine artery had been wounded, the thrombus at the site of the injury becoming detached later. (*See also p. 181.*)

iii. Perforation of the uterus.—The curette, like the dilator, may be pushed through the uterine wall, and the uterine wall may be scraped through by a too vigorous use of this instrument.

The operator must also remember that the point of the curette may catch in a laceration near the internal os, and that such a laceration may be curetted and so made worse. Common prudence, and the knowledge that a laceration may be present, should prevent this from happening, and if a laceration has not been felt by the finger, its presence may be suspected when, instead of passing in smoothly, the point of the curette is arrested at the internal os. This difficulty may be overcome by rotating the curette 45 degrees, so that the broad diameter of the end becomes antero-posterior instead of transverse.

Great care should be taken when curetting a uterus in which carcinoma of the body is suspected, especially in senile cases, for in such the wall may be very thin and soft. The same caution applies to all cases of vesicular mole.

The results and treatment of perforation are dealt with at p. 181.

Dressing and after-treatment.—*See Chapter xxx.* If the vagina has been plugged the gauze must be removed in 24 hours. The patient may get up in 10 to 14 days, if all hæmorrhagic discharge has ceased.

REMOVAL OF RETAINED PRODUCTS OF CONCEPTION

Preparation of the patient.—*See p. 76.*

Instruments.—As for curetting the uterus (p. 211).

Operation.—The steps of the operation are the following :

i. Dilatation of the cervix.—The cervical canal is dilated, as described (p. 176), until the index-finger can be introduced into the uterine cavity—i.e. to No. 18 Fenton. This degree of dilatation is not, however, advisable when removing remains of an early pregnancy through a small cervix which has not previously been dilated by labour, as such a cervix lacerates very easily.

ii. Digital examination.—Auvard's speculum is removed, and the operator having dipped his right forefinger into violet-green, the dilator is removed by the assistant, and the operator, making counter-pressure with the left hand over the pubes, passes the index finger of his right (or left) hand into the cavity of the uterus (Fig. 146). If the fundus cannot be reached in this way, either because the uterus is retroverted or the patient very fat, the volsellum, if already removed, must be re-attached; it can then be pulled on, and the uterus is thus drawn down over the finger and steadied by the assistant during the exploration.

If the uterus is retroverted, it should, if possible, be anteverted first by prising it forwards with a large-sized dilator or the finger.

iii. Removal of retained products with finger or with ovum forceps.—Any portions of placenta or membranes which may be felt are now

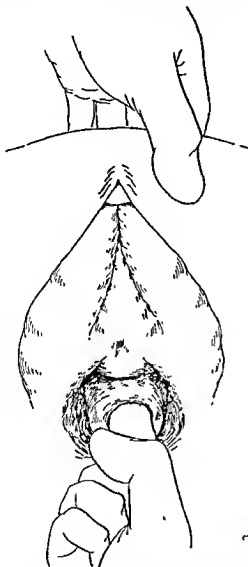


Fig. 146.—Digital exploration of the uterus.

detached with the finger, which is then withdrawn, and, the ovum forceps being introduced, the loose pieces are removed. The finger is then introduced again, and if undetached portions are still felt, the procedure is repeated. If the cervix has not been dilated enough to pass the finger through it, the operator must use the ovum forceps, both for detachment and for removal.

iv. **Curetting.**—Authorities differ as to whether the curette should be used after the retained products have been removed by the ovum forceps and the finger. The decision may be said to depend upon whether the miscarriage, or labour, has quite recently taken place and the operation is being performed for sepsis, or whether some fair interval of time has elapsed since the miscarriage, or labour, and the operation is being performed for hæmorrhage.

Nearly all authorities agree that there is a serious danger in curetting septic cases, because innumerable lymph-channels are thus opened up as sites for infection. In favour of this contention is the fact that serious local lesions such as pelvic peritonitis or pelvic cellulitis often appear after curetting in such cases; and the records of many deaths from general infection can now be collected. Cases of vesicular mole also had better not be curetted lest the uterus be perforated.

On the other hand, in old-standing cases of retained products in which hæmorrhage is associated with but little or no sepsis, the operator will obtain better results by using the curette. When the operation is for the removal of the remains of an early pregnancy, and the cervix is so small that the operator has decided not to dilate it to finger-size, the curette should certainly be lightly applied after the main bulk of the material has been removed with ovum forceps.

For the method of curetting, see p. 210.

v. **Packing the vagina.**—The last steps in the operation, whether the curette is used or is not used, are to douche the interior of the uterus with flavine, 1 in 500, and to pack the vagina with gauze soaked in the same solution for 24 hours.

Dangers and difficulties.—The dangers and difficulties are those discussed under the heads of Dilatation (p. 180) and Curetting (p. 213).

Dressing and after-treatment.—The general after-treatment is discussed in Chapter XXX. The gauze packing the vagina is removed in 24 hours; and if the hæmorrhagic discharge has ceased and the temperature is normal, the patient gets up in from 10 to 14 days.

VAGINAL EVACUATION OF THE PREGNANT UTERUS

When the pregnant uterus has to be emptied of a living gestation before viability, the route to be chosen depends upon the degree of advancement of the pregnancy, and whether or not sterilization by tying the tubes is also indicated. The removal of a pregnancy of not more than 10 weeks through the vagina is not difficult, but after this period the increased size of the fœtus, and particularly its head, makes the procedure more and more troublesome. We are of opinion that a pregnancy over 3 months in duration is, as a rule, best removed by abdominal hysterotomy (see p. 488). When sterilization is indicated as well as termination of the pregnancy, the abdominal route should be chosen whatever the degree of advancement.

The steps of the vaginal operation are the same as those just described under the operation to remove retained products of conception, but the bleeding will be much freer and the cervix, being unexpanded, more difficult to dilate. How much it should be dilated depends on the advancement of the pregnancy and the rigidity or otherwise of the cervix. It is an advantage to be able to introduce the finger, but this must be foregone if it involves splitting the cervix. Repeated use of ovum forceps will eventually bring all the placenta away and the limbs and trunk of the fœtus. The head is the chief difficulty, for it frequently becomes detached from the trunk and eludes the grasp of the forceps. The ovum forceps shown on p. 9 are the best to use, and should be assisted by pushing the head down by abdominal pressure. An injection of ergometrine, by making the uterus contract, helps to bring the head down. At the close of the operation the uterus should be washed out with the flushing curette with 1-in-1,000 flavine, and the vagina packed with gauze soaked in the same.

REMOVAL OF POLYPI—MUCOUS, MYOMATOUS, OR PLACENTAL

Preparation of the patient.—See p. 76.

Instruments.—The instruments required will depend upon which variety of polypus is being treated. In any case a douche apparatus, a catheter, an Auvard's speculum, scissors, two long pressure forceps, two volsella, and a sharp spoon will be required. For a polypus of the body, uterine dilators, a curette, an additional volsellum, a uterine sound, a pair of ring-forceps, two curved needles No. 7, and catgut No. 1. For a myomatous polypus a scalpel may be necessary.

MUCOUS POLYPUS OF THE CERVIX

Operation.—The vagina should be sterilized with violet-green or iodine, after which Auvard's speculum is inserted. The cervix is then steadied with volsella, and the polypus seized with ring-forceps and slowly twisted off (Fig. 147), after which in all cases the cervical canal should be scraped with a sharp spoon, since the polypus is only a localized expression of a general disease of its mucosa.

As a rule, when the polypus is twisted off there is little or no bleeding, but if there is more oozing from the stump than the operator cares to leave, the stump may be touched with the actual cautery, or the vaginal canal may be packed with flavine gauze.

MUCOUS POLYPUS OF THE BODY

Operation.—If when operating for mucous polypus of the cervix

the uterus is found to be enlarged, it is always well to dilate the cervical canal and make a digital examination to ascertain whether there are any polypi in the uterine body, especially if there is a history of profuse hæmorrhage. There need not, however, be polypi in the cervix with



Fig. 147.—Evulsion of a mucous polypus.

polypi in the body ; in the latter case it will be the symptoms which have suggested the presence of a polypus, and the cervical canal must be dilated in order that a digital or instrumental examination may be made to confirm the diagnosis. For dilatation of the cervix, *see* p. 175.

Removal of the polypus.—The polypus is removed by seizing it with a ring forceps and twisting it off. Although the polypus may be felt

with the finger, the operator may not be successful in catching it with the forceps, in which case the polypus may be scraped off in the course of the curettage which should always terminate an operation for mucous polypus of the body, since this condition is merely a local indication of the general disease of the endometrium. For the method of doing this, see p. 210.



Fig. 148.—Removal of a large myomatous polypus: Incising the capsule.

If there is hæmorrhage and it cannot be arrested by a hot intra-uterine douche, the vagina must be packed with flavine gauze.

MYOMATOUS POLYPUS OF THE CERVIX

Operation.—The polypus, if small, is seized with a volsellum, and if its pedicle is thin it can be twisted off in the manner already described for a mucous polypus (p. 218). If too thick for this, the pedicle can be severed by the scissors. In either case, owing to the muscular portion of the pedicle contracting round the vessels and so occluding them, there will not be any hæmorrhage to speak of.

The polypus may, however, be so large that the pedicle cannot be

reached, in which case, the tumour should be seized with a volsellum, its capsule should be incised (Fig. 148), and then reflected with the handle of a scalpel (Fig. 149), and the tumour twisted out of its bed (Fig. 150), pieces of it, if necessary, being cut away with scissors. The collapsed capsule is then twisted round to torsion the vessels, and cut through at its base with scissors (Fig. 151).

Occasionally, myomatous polypi are met with entirely filling the



Fig. 149.—Reflecting the capsule.

vagina. These must be dealt with by the operation of morcellation, to be presently described (p. 227).

MYOMATOUS POLYPUS OF THE BODY

Methods.—The exact method of procedure will vary according to whether the pedicle can be reached, and if not, whether the polypus has, or has not, dilated the cervix.

(a) *When the pedicle can be reached.*—If the pedicle is accessible, the removal is carried out in the same way as that described for a myomatous polypus of the cervix.

(b) *When the polypus has not dilated the cervical canal.*—If the cervical canal is not dilated, then the presence of the polypus is only an assumption from the symptoms complained of and the signs discovered, such as enlargement of the uterus, marked relaxation of the external os, or the sensation of a foreign body on the uterine sound being introduced.

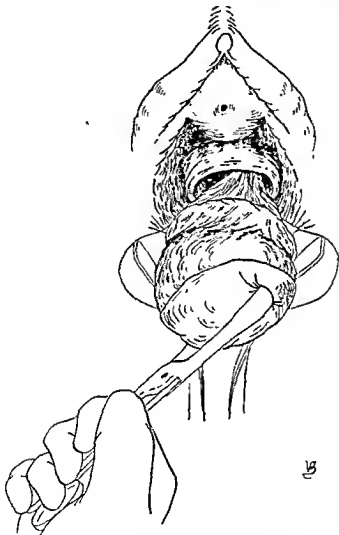


Fig. 150.—Enucleation of the tumour.

The cervix must, therefore, be dilated for diagnostic purposes (p. 175), and the polypus dealt with afterwards.

(c) *When the polypus is dilating the cervical canal.*—In this case it is of the greatest importance for the operator to satisfy himself that the structure presenting is a fibroid polypus and not an inverted uterus. On occasion this mistake has been made, and an inverted uterus has been amputated. The operator should, therefore, make a bimanual

examination to ascertain whether the body of the uterus is in its normal position, or is absent. If the uterine body cannot be felt, this would suggest an inversion, and the examination may reveal a 'cupping' at the top, or this can be felt even more easily by rectal examination. The uterine sound should then be passed, and, if it enters more than the normal distance, this is sufficient evidence that a polypus is present.

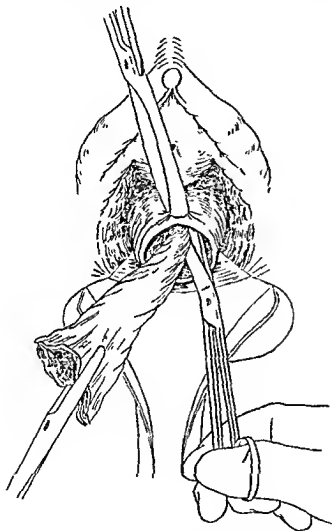


Fig. 151.—Treatment of the pedicle.

If the sound enters less than the normal distance, this suggests an inversion. The operator must bear in mind, however, that the point of the sound may have caught against the pedicle of the polypus at the site of its attachment which, if low down, may prevent the instrument from passing to the top of the uterus. In this event a movement of the sound would free it, and it could be passed farther. Rarely, the polypus may be inflamed and adherent to the cervical canal in the region of the internal os, in which case the sound would enter only a

very little way. Additional signs are that an inverted uterus bleeds easily on being touched, whereas a myomatous polypus does not; moreover, if the inverted fundus of the uterus is projecting through the external os, the internal openings of the Fallopian tubes may be seen.

There is another condition which may simulate a myomatous polypus, and that is a sessile submucous myoma, or sarcoma, which has caused a certain amount of uterine inversion and is presenting. A careful examination on the above lines should reveal the nature of the tumour, which, if a myoma, must then be enucleated in the manner presently to be described (pp. 224-231).

Operation.—If the finger can be introduced by the side of the polypus and its pedicle felt, the polypus may be removed by seizing it with a volsellum, drawing it down, and then cutting through the pedicle with scissors, or, if this is not possible, by first enucleating it from its capsule (p. 220), and dealing with the pedicle afterwards.

Excessive size of the polypus.—In some cases the tumour is so large that the existence of a pedicle is problematical. Many of these cases turn out to be sessile submucous myomata. In this event they should be removed piecemeal, i.e. by morcellation, different parts of the tumour being cut away with scissors until the pedicle, if it exists, can be reached.

Partial inversion.—It may be that the polypus, when it is pulled upon, inverts that portion of the uterus to which the stump is attached, so that the operator must be sure he is cutting through the pedicle and not through the inverted piece of uterine wall. This danger is avoided if the tumour is enucleated before dealing with the pedicle.

Hæmorrhage.—If the bleeding does not stop with the administration of a hot intra-uterine douche, the vagina must be packed with flavine gauze.

PLACENTAL POLYPUS

In this case a piece of placenta or membrane has remained attached to the uterus and has become partially organized. The treatment is the same as that of a mucous polyp.

Dressing and after-treatment of operations for polypi.—When the polypus has been removed the vagina is douched and, if there is undue loss going on, the vagina is packed with flavine gauze for 24 hours. For the after-treatment *see* Chapter xxx. After the removal of cervical polypi the patient may get up in 2 or 3 days—in fact, when the hæmorrhagic discharge has ceased. When the growth is corporeal and the uterus has been dilated, the patient must stop in bed for ten days to a fortnight. In these cases it is well to hasten the involution of the uterus by the administration of ergot.

ENUCLEATION OF SUBMUCOUS MYOMATA

The necessity for this operation will be discovered on digital examination of the uterine cavity, made for purposes of diagnosis.

Limitation.—Vaginal enucleation of a submucous myoma should be attempted only when the meridian of the tumour is free in the uterine cavity, when the tumour is not larger than a tangerine orange, and when it is apparently the only myoma of any size in the uterus. This last statement is not meant to exclude those cases in which there are two small submucous tumours, but when interstitial or sub-peritoneal tumours can be felt it is a much safer and more satisfactory procedure to perform abdominal enucleation or hysterectomy.

Preparation of the patient.—See p. 76.

Instruments.—Douche apparatus, a catheter, Auvard's speculum, two volsella, uterine dilators, scalpel, scissors, four pairs of long pressure forceps, ring forceps, curved needle No. 7, catgut No. 1.

Operation.—i. Dilatation of the cervix (p. 175) is the first step in the operation.

ii. Incision of mucous membrane.—The index finger of the left hand is passed into the uterine cavity and the relations of the tumour are examined. The scalpel, or scissors, being passed along the index finger, an incision is made in the mucous membrane covering the tumour, sufficiently deep to penetrate the capsule and large enough to allow the point of the finger to pass in.

iii. Enucleation from the capsule.—The index finger of the left or the right hand, whichever is the more convenient, is then pushed through the hole in the capsule and the tumour is enucleated from its capsule, the remaining hand pressing down the uterus from the abdomen to steady it and bring the growth more into reach. As a rule, the tumour will be easily enucleated. When free, it must be seized with a volsellum or, if small, with a ring forceps, and gradually delivered through the cervix.

Difficulties. i. Adherent capsule.—Sometimes it is not easy to enucleate the tumour from its bed with the finger, and in these cases the myoma should be seized with a volsellum, by means of which the tumour can be twisted in various directions, while the finger tries to free it, helped perhaps now and again by a few careful snips with the scissors.

ii. Excessive size.—Roughly speaking, a myoma the size of a tangerine orange can be delivered through a fully dilated cervix. If the tumour is larger than this, the operator may be able to deliver it by incising the cervix antero-posteriorly up to the vaginal vault, or more room may even be obtained by pushing the bladder off the uterus and then incising the cervix and the anterior surface of the uterus as high as the peritoneal reflection. If, in spite of this incision, or preferably before its employment, the tumour is found to be too large to deliver whole, it must be cut up and removed in small pieces (*morcellation*).

Myomata up to the size of an orange may be removed in this way; but if larger, the tumour should be removed through the abdomen.

iii. Adeno-myomata.—These tumours—more properly called uterine endometriomata—are usually submucous, and cannot from the symptoms or feel be distinguished from pure myomata. They are never truly encapsuled, however, and hence attempts to enucleate them in mistake for a submucous myoma always fail.

Dangers. i. *Incomplete removal.*—It occasionally happens that the operator misjudges the size of the tumour he sets out to remove, and, after tearing away several pieces of it, finds that he cannot finish the enucleation, while adeno-myomata, which mimic myomata, do not have any capsule and cannot be enucleated. The dangers that may accrue from this unsuccessful effort are hæmorrhage and sepsis. We have seen a case in which bleeding came on so profusely half an hour after a partial enucleation that the patient was only saved by an immediate hysterectomy. Sepsis is brought about by the remaining portion of the fibroid sloughing out, during the process of which the patient may die, or be dangerously ill for many weeks.

The only course to pursue, if enucleation prove a failure, is immediately to perform hysterectomy.

ii. *Hæmorrhage.*—As a rule, there is not any hæmorrhage to speak of with this operation. If it is a cervical myoma that has been enucleated, the bleeding may be serious from damage to the uterine arteries. If a hot uterine douche will not stop the bleeding, the treatment is to pack the uterus with gauze and, this failing, to perform hysterectomy.

iii. *Sepsis.*—Apart from a portion of the tumour being left behind, the patient may be infected by septic instruments or fingers, or the myoma may be already septic before the operation. The first source of danger is to be obviated by strict asepsis and antisepsis prior to, during, and after the operation. In the case of tumours already infected, the operation should be performed with as little laceration of the healthy tissues as may be possible, and the uterus thoroughly irrigated with 1-in-1,000 flavine solution.

iv. *Perforation of the uterus.*—The uterus may be perforated by a too vigorous use of the finger, or of the scissors, during separation of the capsule, the operator failing to appreciate the fact that the tumour reaches almost up to the peritoneal covering of the uterus. Again, when the tumour is being removed by morcellation, the operator may incise the muscle-wall with the scissors in mistake for the tumour, and this is the more likely if the uterus has already been partially inverted by the traction that has been made on the tumour. If the cavity of the uterus is clean when the accident occurs, ill results may not follow

and, unless the rent is large, or the hæmorrhage free, the uterus after the removal of the tumour should be packed with gauze soaked in 1-in-1,000 flavine and the case watched. If, however, a sloughing myoma is being dealt with, or the rent is large, or a piece of bowel comes through the rent, it is urgent at once to open the abdomen and remove the uterus.

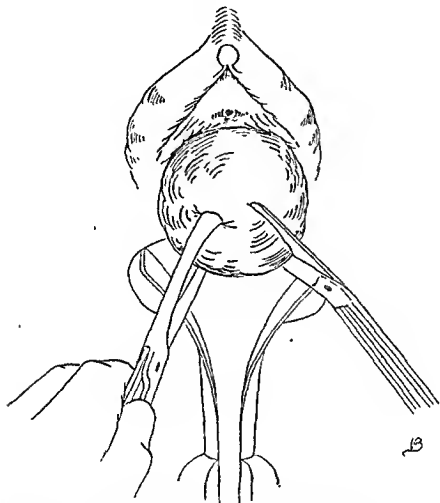


Fig. 152.—Morcellation of a submucous myoma extruding from the uterus : Cutting away the lower pole of the tumour.

Dressing and after-treatment.—See Chapter xxx. The patient can get up on the 14th day if all hæmorrhagic discharge has stopped.

REMOVAL OF A LARGE SUBMUCOUS MYOMA BY MORCELLATION

Occasionally a submucous myoma is so large that, growing downwards, it dilates the cervical canal and gradually fills the vagina. These cases differ from large myomatous polypi inasmuch as they are attached

to the uterus by a very broad base and not, as in the case of polypi, by a pedicle.

Preparation of the patient.—See p. 76.

Instruments.—Auvard's speculum, scalpel, scissors, four pairs of long pressure forceps, ring forceps, two volsella, Reverdin's needle, two curved needles No. 7, catgut No. 1, catheter, broad vaginal retractor.

Operation.—The steps of the operation are as follows :

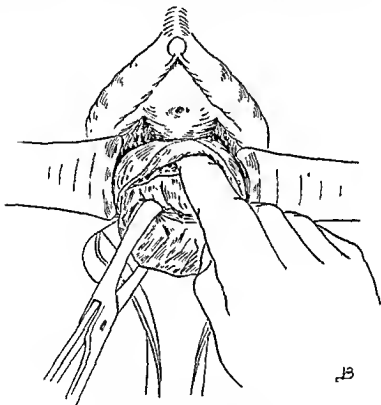


Fig. 153.—Reflecting the capsule.

i. **Incising the capsule.**—The tumour is seized with the volsellum, drawn down, and its lower pole (Fig. 152) cut away with scissors, by which means the edge of the capsule is exposed.

ii. **Enucleating the tumour.**—The tumour is now gradually enucleated, being pulled down with a volsellum held in the left hand, while the forefinger of the right hand reflects the capsule (Fig. 153).

iii. **Removing the tumour.**—After as much of the tumour has been stripped of its capsule as is possible for the moment, that portion is removed with a pair of scissors (Fig. 154). The volsellum is then passed up inside the capsule, and the tumour again seized, pulled upon and

stripped until another portion can be cut off. This process is continued until at last the upper pole of the tumour is shelled out and delivered (Fig. 155).

iv. Treatment of the capsule.—The capsule is now pulled down with a pair of ring forceps, and cut off as near the uterine wall as possible.

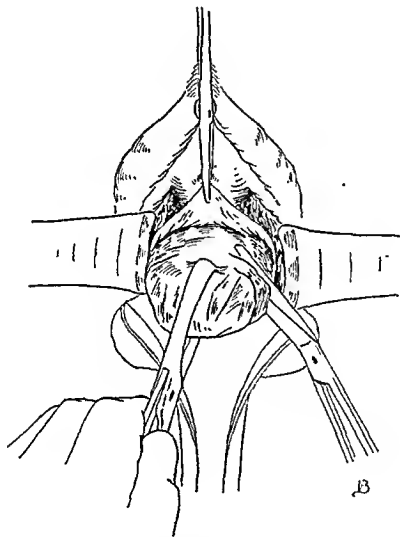


Fig. 154.—Continued removal of the tumour.

It can be ligatured before division but, as a rule, there is not any bleeding, and if there is, this can be arrested by packing the vagina.

Dangers.—The uterine wall may be perforated during the enucleation, or the operator may have misjudged the condition and be unable to remove all the tumour; in either case the course to be followed is immediately to remove the uterus through the abdomen.

Dressing and after-treatment.—See Chapter XXX. The patient gets up on the 14th day, if all hæmorrhagic discharge has ceased.

ENUCLEATION AFTER VAGINAL HYSTEROTOMY

When the uterus contains a large submucous myoma which has not dilated the cervix, access to it may be obtained by splitting the anterior cervical and uterine wall as far as the peritoneal reflection.

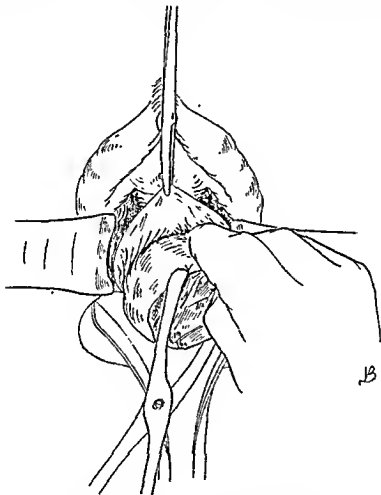


Fig. 155.—Enucleation of the upper pole of the tumour.

Instruments.—As for morcellation (see p. 228).

Operation. 1. Reflecting the bladder.—The cervix having been pulled down, the mucosa covering its front surface is picked up and divided transversely for about an inch. Through the gap thus made the attachment of the bladder to the front of the cervix is exposed and the bladder is separated by the finger, aided by scissors. The

reflection is not extended laterally, but over a median area corresponding to the breadth of the cervix (*see* p. 492).

ii. Splitting the cervical wall.—By means of a strong pair of scissors the anterior cervical wall is divided in the middle line up to and slightly beyond the internal os.

iii. Removing the tumour.—The tumour is now removed either by simple enucleation or by morcellation, in the manner already described (*see* pp. 224-230).

iv. Suturing the cervical incision.—The cervix being well pulled down, the incision in it is closed by a series of strong 20-day catgut sutures.

Dangers.—Those of morcellation and enucleation (*see* pp. 226-229). We do not think well of this operation, and are of opinion that in all but exceptional cases a tumour so large as to require hysterotomy for its removal *per vaginam* had far better be dealt with through an abdominal incision.

CHAPTER X

HYSTERECTOMY : GENERAL CONSIDERATIONS

I. INDICATIONS FOR HYSTERECTOMY

THE uterus is usually removed for conditions affecting the organ itself, but occasionally its removal becomes a matter of necessity in the course of an operation for tubal or ovarian disease, or for large tumours of the broad ligament, in order that the object of the operation may be attained.

The conditions affecting the uterus for which its removal may be indicated are—

- | | |
|-----------------------|---|
| 1. Injuries | Rupture. |
| 2. Inflammation | Acute metritis, chronic metritis, chronic subinvolution, fibrosis, senile endometritis, tuberculous endometritis. |
| 3. New growths | Myoma, adeno-myoma, carcinoma, sarcoma, chorion-epithelioma, hydatid disease, villous papilloma, pregnancy in an undeveloped horn of the uterus or interstitial portion of the tube, accidental hæmorrhage. |
| 4. Congenital defects | Hæmatometra. |
| 5. Acquired defects | Dysmenorrhœa, inversion, hæmatometra, intractable hæmorrhage apart from inflammation or new growth, torsion. |

1. **Injuries.** i. **Obstetrical.**—Rupture of the uterus during labour may be an indication for hysterectomy. The advantage of the operation is that it removes the damaged organ and prevents any further hæmorrhage and the risk of intra-uterine sepsis. Its disadvantage is the sacrifice of the organ.

Extraperitoneal tears and small intraperitoneal tears low down, without prolapse of bowel or omentum, may be treated successfully by plugging the rent with gauze. Large transverse tears, with deficient retraction of the uterine muscle and profuse external hæmorrhage, or cases in which bowel or omentum prolapses, or in which it is certain that severe intraperitoneal bleeding is taking place, should be immediately operated upon. If the tear cannot be satisfactorily sutured the uterus should be removed.

ii. **Operative injuries.**—This subject will be found fully discussed in connexion with the dangers of dilatation and curettage of the uterus (pp. 180-215).

iii. *Accidental injuries.*—Most of these injuries occur to the pregnant woman. If the uterus is septic before the surgeon sees the patient, as when the perforation has occurred in the course of an attempted criminal abortion, it may be proper to remove the damaged organ. If the patient is seen soon after the uterus has been injured, as, for example, in gunshot wounds, or goring by cattle, the same treatment may be necessary, or the rent may be sutured after the removal of products of gestation.

2. *Inflammation.*—The results of removing the uterus for acute puerperal sepsis are generally disastrous; the operation, therefore, is but rarely carried out. If, however, the uterine wall is found to be the seat of abscess formation, or a sloughing myoma, or is ruptured, the organ must be removed.

The removal of the uterus is sometimes indicated in chronic septic infection of its interior, usually gonococcal, the symptoms of which, a persistent excoriating discharge and profuse hæmorrhage, have defied all other methods of treatment. Most of these cases have already had both tubes or both appendages removed for pyosalpinx. Hysterectomy is occasionally performed for senile endometritis and the presence of a pyometra that cannot be cured by dilatation and curettage.

There is a group of cases exhibiting most profuse menorrhagia in which the symptoms are due to a diffuse degeneration affecting the whole thickness of the uterine wall or to profound endocrine changes in the endometrium (*metropathia hæmorrhagica*). Most of these cases are the result of chronic subinvolution and many are best treated by hysterectomy.

Tuberculous endometritis is a rare disease, and its symptoms are frequently mistaken for those of carcinoma of the uterus. When the nature of the condition is made clear by proper examination, the uterus should be removed, in the absence of symptoms of generalized tuberculosis.

3. *New growths.* i. *Myoma, adeno-myoma.*—Hysterectomy as a treatment for these tumours may be a matter either of necessity or of expediency.

When the tumour is endangering the patient's life from hæmorrhage, pressure, or infection, its removal is absolutely necessary, and hysterectomy is, as a rule, the best way of removing it, unless myomectomy is indicated (*see p. 421*), and the same applies to those cases in which the symptoms, while not directly endangering life, prevent the patient from earning her living.

If the symptoms are in any way affecting the patient's health, or seriously interfering with her comfort or social occupation, the removal of the tumour is expedient, either by hysterectomy or myomectomy. There are also certain cases in which one or other of these operations

is indicated in the more or less complete absence of symptoms, because of the practical certainty that sooner or later such symptoms will eventuate: for instance, a fibroid, the size of an orange, accidentally discovered in a girl of 28 years of age.

When watching the performance of a formidable hysterectomy upon a patient exsanguinated from prolonged bleeding and with her general health depreciated by pain and toxic absorption, it is melancholy to reflect that there was a time when the tumour could have been removed with the greatest ease and almost perfect safety, without sacrificing the uterus.

ii. Malignant disease.—Malignant disease is an indication for hysterectomy, if the operation be possible. Further discussion of this point will be found in the chapter on the radical operation for carcinoma of the cervix (Chapter XVI, p. 364).

iii. Other new growths.—All other new growths of the uterus are extremely uncommon. Rarely, villous papillomata are met with springing from the endometrium. The nature of these tumours and their relation to carcinoma are so little known that the safest course is to treat them as though they were malignant and extirpate the uterus. Hysterectomy has also had to be carried out for echinococcus cysts of the uterus.

4. Congenital defects.—There are certain congenital defects of the genital tract which may result in conditions necessitating the removal of the uterus; the most common example of these being a hæmatometra dependent on partial or entire absence of the vagina. Occasionally hæmatometra occurs in the undeveloped half of a double uterus, while, rarely, pregnancy takes place there. In either event, removal of the malformed half of the uterus will be necessary.

5. Acquired defects.—Hysterectomy is sometimes indicated to stop the periods in cases of intractable dysmenorrhœa or uterine hæmorrhage disabling the patient. Chronic inversion of the uterus has been treated successfully by hysterectomy, other methods having failed. Finally, removal of the uterus may be indicated as the remedy for some artificially acquired stenosis of the genital canal producing hæmatometra. The most common cause of this is scar-contraction of the cervix following a high amputation of it, or sloughing after labour.

The conditions affecting the Fallopian tube for which hysterectomy may be indicated are—

i. Tubal gestation.—There are three sets of circumstances in which the uterus may have to be removed for this disease. (1) The gestation-sac may be so adherent to the back of the uterus that its removal without undue bleeding involves removal of the uterus as well. (2) In cases of interstitial pregnancy the uterine wall may be so destroyed that it is impossible to conserve it. (3) In advanced cases of secondary

intraperitoneal or intraligamentous gestation the placenta is almost certain to be more or less attached to the surface of the uterus, which organ may have to be removed *en masse*, with the placenta, to prevent hæmorrhage.

2. **Salpingitis.**—It is maintained by many Continental authorities that in bilateral salpingo-oöphorectomy, or salpingectomy, the uterus should be removed, for they argue that it is of no further use, and that it may become a source of trouble from hæmorrhage and discharge, or of danger from cancer. Our practice has not been of this radical nature; we limit the removal of the uterus together with the tubes to certain cases of salpingitis in which it is necessary in order to control hæmorrhage during the operation or to cure pre-existent menorrhagia or discharge.

There can be no doubt that in acute pelvic inflammation the removal of the uterus adds an appreciable risk to the operation. The advantage of vaginal drainage has been urged as a reason for its performance, but we would refer the reader to the remarks upon this subject at p. 49.

3. **Carcinoma of the Fallopian tube.**—This rare condition is only adequately treated by removing the uterus in addition to the diseased structures.

The conditions affecting the ovary for which removal of the uterus may be indicated are—

1. **Ovarian cysts and tumours.**—Hysterectomy should be performed in addition to bilateral salpingo-oöphorectomy in most cases in which the ovary is the seat of operable malignant disease. An ovarian cyst may be so adherent to the uterus that its separation is impossible, and in this case the uterus will have to be removed with the tumour.

2. **Ovarian abscess.**—The remarks made above about salpingitis are equally applicable to this condition.

The conditions affecting the broad ligament for which removal of the uterus may be indicated are—

Cysts and myomata.—It sometimes happens that, in order to effect the removal of a cyst deeply imbedded in the broad ligament, it is necessary to remove the uterus, from which the cyst cannot be separated; while in the case of a myoma of the broad ligament the removal of the uterus may be an essential part of the operation (*see* p. 355).

II. COMPARATIVE ADVANTAGES OF SUBTOTAL AND TOTAL HYSTERECTOMY

The circumstances in which it is proper to remove the entire uterus are malignant disease, carcinoma of the Fallopian tube or ovary, tuberculous endometritis, sepsis in all its forms, hydatid disease, villous

papilloma of the endometrium, inversion, acquired hæmatometra, certain forms of congenital hæmatometra, and myomata with co-existent cervicitis.

For all other conditions requiring hysterectomy the removal of the body alone will be found sufficient, and, in our opinion, is the best. This, however, is not in accordance with the views of all surgeons. It will therefore be profitable at this point to discuss the relative merits of the total and subtotal operations respectively.

Those surgeons who practise the total operation in every case requiring hysterectomy argue that this method is the best because—

1. Better drainage of the operation-site is secured.
2. The cervical stump may become septic as a result of the operation.
3. The uterus may be the seat of malignant disease at the time of the operation, though not so diagnosed.
4. The conserved cervix is useless, and may subsequently become the seat of malignant or inflammatory disease or may even, unknown to the operator, be malignant at the time of the operation.
5. This advantage is gained and these dangers are avoided without any increase in operative difficulty and mortality, or subsequent liability to interference with the marital function.

The counter-arguments by which the advocates of subtotal hysterectomy maintain the correctness of their position may conveniently be dealt with in the same order, as follows:

1. **Better drainage.**—The objects of drainage in a surgical operation are twofold—(1) to allow the escape of discharges already septic, (2) to permit the free escape of an anticipated collection of blood, or serum, which if retained might become infected.

We have already stated that, if the uterus is infected, it should be removed entire. If the operation of subtotal hysterectomy has been efficiently performed, a collection of blood or serum should not occur and therefore, in what we may term clean cases, the increased freedom of drainage conferred by total hysterectomy is not only unnecessary but is actually harmful, in that it brings the operation area into direct continuity with a surface (the vagina) which is never sterile.

2. **Septic stump.**—That the stump may become septic in subtotal hysterectomy is true, but this is due to failure of asepsis in the technique, and not to the kind of operation performed, for the amputation occurs across a portion of the genital canal which is normally sterile. In total hysterectomy, on the other hand, infection of the operation-area is much more likely because of the contiguity of the vagina.

3. **Presence of undiagnosed carcinoma.**—Occasionally it has happened that the body of the uterus, having been amputated, is

found when opened to be the seat of undiagnosed malignant disease. More rarely the conserved cervix has at the time of operation been the seat of unrecognized carcinoma. The first disaster may be minimized by the habit of carefully examining the body of the uterus directly it is removed, and, in the event of malignant disease being found, forthwith extirpating the remainder of the organ. The second disaster is very uncommon indeed. In the hands of careful surgeons, both occur but very rarely; nevertheless, these possibilities are undeniable drawbacks to subtotal hysterectomy.

4. **The cervix is useless and liable to disease.**—The cervix is not useless. The secretion of its glands is an important lubricant to the vagina.

After removal of the cervix a scar is left across the roof of the vagina, which for some time at all events, and in many cases for at least a year, may be the seat of tender and perhaps hæmorrhagic granulation-tissue, and gives rise to a troublesome discharge until a ligature or ligatures become separated. When healing eventually occurs, there is a tendency for the vaginal vault to become puckered and constricted. Furthermore, the ovaries (if they have been conserved) or the intestine or bladder, may become adherent to the line of peritoneal suture overlying the vagina. Any of these sequelæ may be the cause of dyspareunia, and, though the structures mentioned may become adherent to the suture-line across the cervix, yet in this case the cervical stump intervenes between them and the vaginal roof.

Further, the cervix has a sexual value. Its secretion plays a part during intercourse, while in certain individuals it constitutes an erotogenic zone. For both these reasons its removal is a definite loss to a woman. Moreover, its conservation maintains the integrity of the vaginal vault and, if this is already weak, the removal of the whole uterus is almost certain to be followed by more or less yielding, producing a form of vault-prolapse peculiarly difficult to cure, short of excessively narrowing the vagina (*see page 513*).

Subtotal hysterectomy is most often performed for myomata or a myoma, and it is in the discussion of the operative treatment of this disease that such great divergence of opinion has chiefly occurred. Statistics show that carcinoma of the cervix is extremely rare in women who have not borne children and still rarer in virgins. A large proportion of the patients operated upon for myomata belong to these two classes. The fact remains, however, that carcinoma does sometimes subsequently affect a cervix left after subtotal hysterectomy; and this would be a strong point in favour of the total operation if it were the only aspect of the case to be considered.*

5. **Operative mortality and morbidity.**—Admitting certain of the points claimed for total hysterectomy as a routine method, the question

* There were 7 instances of stump carcinoma amongst 500 Wertheim operations for carcinoma of the cervix recorded by Victor Bonney (*Brit. Journ. Obst. Gyn.*, Vol. XLVIII, No. 4, p. 421).

remains whether these advantages are not too dearly bought by the increased risk of the operation as regards mortality and morbidity when compared with the results of the subtotal method in suitable cases.

There is no doubt that the subtotal operation is always the easier, and sometimes very much the easier, and is performed in less time and with a diminished chance of injury to the important structures adjacent to the uterus. In our own hands an average straightforward total hysterectomy takes, under favourable conditions, from 25 to 30 minutes to perform, whereas by the subtotal method the operation can be completed well within 20 minutes; and not infrequently well under 15 minutes; and we believe this to be the experience of others versed in this class of work.

The increased risk to the bladder, bowel, or ureters in total hysterectomy is obvious from anatomical considerations, and is considerably enhanced in certain circumstances, such as great depth of the pelvis, marked obesity, and abnormal fixity of the uterus. In the hands of experts such accidents are rare, but it is none the less true that injuries to the bladder, bowel, and ureter are much commoner in total hysterectomy. We have already referred to the additional danger of infection in total hysterectomy. This, with the risk of the aforementioned injuries, results in an increased mortality- and morbidity-rate in total hysterectomy as compared with that of the subtotal method.

These remarks on the relative difficulties of the two operations, founded upon our experience and the work of expert operators, obviously apply with much greater force to the practice of those inexperienced in gynæcological surgery.

Setting, then, the advantages claimed for the habitual practice of total hysterectomy against its disadvantages, we are of opinion that it is only the operation of election in certain cases, and that the cervix should be conserved whenever it may be held to be healthy.

III. COMPARATIVE ADVANTAGES OF ABDOMINAL AND OF VAGINAL HYSTERECTOMY

The frequency with which vaginal hysterectomy is performed varies considerably in different countries and in the practice of different surgeons. There are some who consider this method to be the one of election when the extirpation of the whole uterus is indicated and it is possible to remove it by this route. There are others who only resort to the method occasionally, and then because there is some very strong contra-indication to the abdominal operation.

There are many cases in which the performance of vaginal hysterectomy is obviously out of the question on account of the narrowness of the vagina or the size, fixity, or uncertain nature of the tumour. But, limiting the discussion to those cases in which the uterus is

removable by either route, the advantages and disadvantages of vaginal and abdominal hysterectomy can be discussed under the following heads :

1. **Shock.**—It is claimed that, when vaginal hysterectomy is performed in suitable cases, the likelihood of post-operative shock is much less than if the uterus had been removed *per abdomen*. This argument had much more force in the past when the technique of abdominal hysterectomy was far less perfect than it is now. At the present time, given cases in which the difficulty of the operation is about the same by either route, it cannot be contended that there is a much greater likelihood of shock in the one than in the other. In certain circumstances, as for instance, extreme obesity or flatulent distension, the abdominal operation may be very much more difficult than that by the vagina, and therefore attended with much more risk of shock.

2. **Drainage.**—In cases in which drainage is indicated after hysterectomy, it is claimed that it will be more efficiently carried out *per vaginam* than through an abdominal incision. The relative merits of abdominal and vaginal drainage have been already discussed (p. 49).

3. **Operative accessibility.**—In certain cases, as, for instance, when the patient is very fat and the vagina large and lax, the uterus is more accessible by the vagina than by the abdomen, and more especially if the uterus is at the same time not enlarged, or even smaller than normal.

Occasions may arise also when an abdominal wound is contra-indicated by some unhealthy condition of the abdomen, such as eczema, septic blisters from too hot fomentations, suppurative omphalitis, or a colostomy wound. In these circumstances, if the case is otherwise suitable, vaginal hysterectomy is indicated.

In the majority of cases, however, it cannot be doubted that the operation is much easier through an abdominal incision.

This advantage of greater operative ease should not in itself weigh down the considerations that tell in favour of vaginal hysterectomy. The increased facility accorded to the operator, however, is associated with greater safety to the patient, since the relation of the diseased organ to the adjacent structures can be more clearly defined, and any complication, such as adherent intestine, omentum or appendages, can be more easily dealt with and runs no risk of being overlooked. Again, the separation of adhesions is more easily and safely accomplished by abdominal manipulation ; any bleeding-points can be more certainly secured ; and the bladder, rectum, and ureters run less risk of being wounded.

In abdominal hysterectomy the cut surfaces of the broad ligaments and vagina are separated from the abdominal cavity by the accurately

sutured peritoneal flaps, whereas in vaginal hysterectomy these raw surfaces are imperfectly covered, and therefore form possible sites for intestinal adhesions. By the abdominal route the operator is at liberty to conserve the cervix if he wishes to do so, or even the whole uterus if he finds that the tumour can be enucleated, whereas by the vagina he has no such choice. Finally, in cases in which the uterus is enlarged or adherent, its removal by the abdomen can be carried out so much more quickly that this more than counterbalances the lessened tendency to shock and the quicker convalescence associated with the vaginal operation.

4. **Site of wound.**—One of the greatest of the disadvantages attaching to the vaginal route is the difficulty of rendering it aseptic as compared with the abdominal skin. On the other hand, a drawback to abdominal hysterectomy is the parietal wound, which, apart from its unsightly appearance, might develop a stitch-abscess or a hernia. A vaginal wound, on the other hand, does not leave any visible scar, and, though it suppurates more frequently, does not cause so much distress as an abdominal sinus, while a hernia in this situation is unknown. On the other hand, a vaginal scar may be the cause of dyspareunia.

After a careful consideration of the arguments advanced on both sides, and while admitting that the results of those who operate by the vaginal route, as a routine method, are in many cases very good, we are strongly of opinion that abdominal hysterectomy in the majority of cases is the safer procedure for the patient.

The scope of vaginal hysterectomy can be extended by the adoption of the paravaginal incision, presently to be described, which very considerably enlarges the operator's field of action. While, however, the difficulty of access to the pelvis is by this means diminished and larger tumours can be dealt with, many of the disadvantages already discussed are not materially obviated.

IV. THE CONSERVATION OF OVARIES IN HYSTERECTOMY

To remove a healthy functional ovary in order to facilitate an operation is, failing exceptional circumstances, bad practice.

The effect of removal of both ovaries in a woman varies considerably, according to her age and temperament. Speaking generally, the nearer her age is to the time of the climacteric, the less is the value of the ovaries in her economy. There is, however, no means of assessing the value in individual cases, and we have met with many instances in which double oöphorectomy performed upon a patient close on, or even over, 50 years of age, has been followed by violent climacteric disturbances. For this reason conservation is the wisest course to pursue.

The effect of ablation of the ovaries on sexual desire varies. In most cases it is abolished, though on occasions no difference may result while sometimes, though very rarely, it may be enhanced. A further serious drawback is the post-climacteric atrophy of the vagina which takes place. This is not a matter of moment when the vagina is capacious as the result of childbirth, but in many nulliparæ it is a matter of serious concern.

The result of oöphorectomy on the mind varies considerably, according to the individual. If a woman is mentally stable ill-results in this respect need not be anticipated.

From an æsthetic point of view the removal of both ovaries is a distinct drawback, since a large proportion of women thus operated upon become markedly obese.

Under certain conditions, an ovary or ovaries otherwise fit for conservation may have to be removed, as, for example, when the bleeding from it, or them, cannot satisfactorily be controlled by ligatures, or when the surgeon suspects or knows of malignant disease in the uterus, for by removing them he widens the area of excision.

It must also be remembered that while it is best to conserve both ovaries if feasible, even part of one may be of service to its owner.

A number of experiments by different observers have shown that in animals the removal of the uterus does not hinder ovulation, and this is also true of women. In our experience, a hysterectomy with conservation of the ovaries does not accelerate the climacteric symptoms, though in some patients it does seem to give rise to congestive sensations similar to but much less in degree than the "flushings" of the menopause. The subject of ovarian conservation is discussed on p. 611 in more detail.

OVARIAN GRAFTS

The effect of transplanting the ovary of one individual into another is in all cases the same: the transplanted tissue dies.

When, however, slices of the ovary of the same individual are simply transplanted from the normal position into some other site in the body, the grafts may, for a time at least, continue to live and to function.

Method.—The method usually adopted is immediately to place the separated ovary in warm saline solution until the operation has reached that stage at which the graft is to be implanted.

The site of implantation is preferably the anterior abdominal wall between the peritoneum and the rectus muscles.

After the peritoneal layer of the wound has been closed the ovary should be cut into several slices, which are then laid under the rectus muscle, after which the aponeurosis is sutured in the ordinary way.

Such grafts never give trouble, in our experience, and in some cases

they undoubtedly permit of menstruation continuing for a year or two at least. More important than this is their result as regards the advent of climacteric symptoms. We believe that the grafts do undoubtedly postpone the appearance of such symptoms, but only for a while, though probably their severity is modified. The point is one very difficult to decide, because of the extremely variable effects produced by removal of both ovaries in different women.

It is significant that in two cases in which we had to re-open a wound in which ovarian tissue was grafted no vestige of the grafts could be seen. Cases are on record in which the graft became cystic.

We cannot help thinking that an ovary which is fit to graft is worth leaving *in situ*.

CHAPTER XI

VAGINAL HYSTERECTOMY AND HYSTERO-VAGINECTOMY

Preparation of the patient.—*See* p. 76.

Instruments.—The instruments given in the general list on p. 274

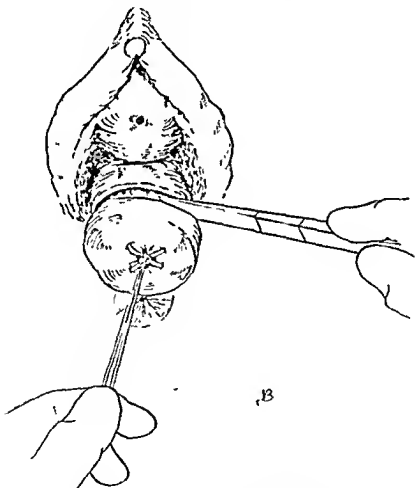


Fig. 156.—Vaginal hysterectomy : Anterior incision of the cervix.

will be needed, but all the pressure forceps must be of the long variety, and in addition a douche apparatus, a catheter, an Auvard's speculum,

2 vaginal retractors, an additional volsellum and a Reverdin's needle will be required.

Cleansing the vaginal canal.—The vagina is thoroughly swabbed with 2-per-cent. iodine solution, or, still better, is packed for three hours with gauze soaked in Violet-green solution (*see* p. 30), diluted with an equal quantity of water.



Fig. 157.—Separation of the bladder.

Operation.—The following are the steps of the operation :

i. **Closing the cervical canal.**—A catheter having been passed to draw off any urine, the cervical canal is closed with a No. 6 silk ligature used double, the long ends of which are then used as a tractor.

ii. **Identifying the limits of the bladder.**—A sound is passed into the bladder and the relations of this organ to the vagina are carefully noted. Especially is it important to determine how far the bladder reaches down the anterior wall of the cervix, since, on stripping it off the cervix before opening the utero-vesical pouch, the bladder may be injured.

iii. Separating the bladder.—By traction on the cervix the uterus is pulled down to the vaginal outlet. With a scalpel the anterior vaginal wall on the front half of the cervix is incised transversely as high up as the previously ascertained position of the bladder allows, care being taken not to cut into the cervix (Fig. 156). The bladder is then

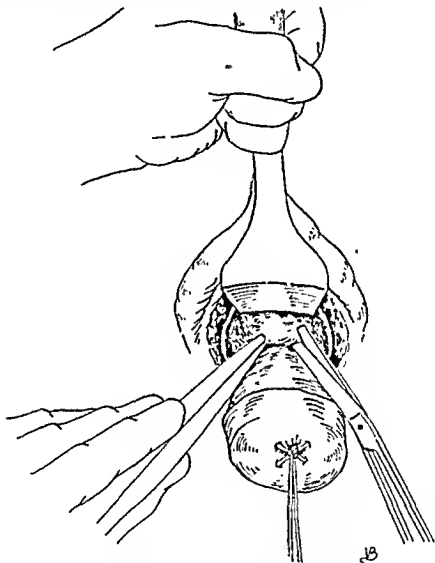


Fig. 158.—Opening the utero-vesical pouch.

separated from the cervix, at first with the handle of the scalpel or with scissors, and, when the layer of cellular tissue between the bladder and the cervix is identified, the forefinger pushes up the bladder until the utero-vesical reflection of peritoneum is reached (Fig. 157).

iv. Opening the utero-vesical pouch.—The left index finger is pushed up to the peritoneal reflection and the peritoneum is seized with a pair

of dissecting forceps, and then, with one or two gentle snips with blunt-pointed scissors, the peritoneum is cut through (Fig. 158).

v. Enlarging the utero-vesical pouch laterally.—The forefinger of each hand is then pushed through into the utero-vesical pouch and the opening enlarged laterally by a stretching movement (Fig. 159).

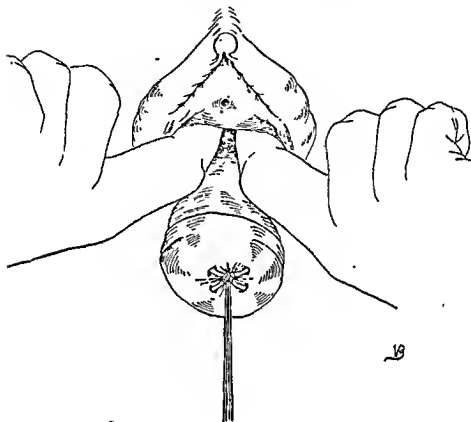


Fig. 159.—Enlarging the opening in the utero-vesical pouch.

vi. Opening the utero-rectal pouch.—Auvard's speculum having been inserted into the vagina, the cervix is next drawn forwards and the vaginal wall is incised at the level of the posterior vaginal fornix (Fig. 160). The incised vaginal wall is now pushed up with the index-finger until the peritoneum is reached; this is seized with a pair of dissecting forceps and cut through with the points of the scissors pressed against the uterus (Fig. 161). The opening is then enlarged with the finger (Fig. 162). The primary cut is then lengthened transversely and the incision is carried round on each side of the cervix till the anterior and posterior incisions are continuous. A quicker and just as efficient a method of opening the utero-rectal pouch is to cut

side, so as to give as much room as possible in the lateral fornix, the operator inserts his thumb behind the lower part of the broad ligament, palmar surface upwards, and his index-finger in front of the broad

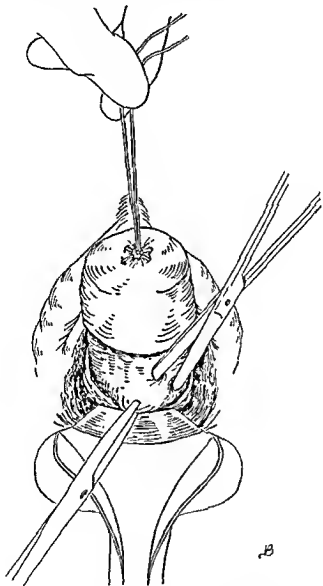


Fig. 161.—Opening the utero-rectal pouch.

ligament, palmar surface downwards (Fig. 163), and by their pressure steadies that portion of the broad ligament which is in relation with the side of the cervix, and at the same time with the aid of the thumb he identifies the uterine artery.

ix. Clamping and dividing the cervical branches of the uterine vessels.— A retractor having been inserted to allow more room, a pair of pressure forceps is now applied to the lower part of the broad ligament,

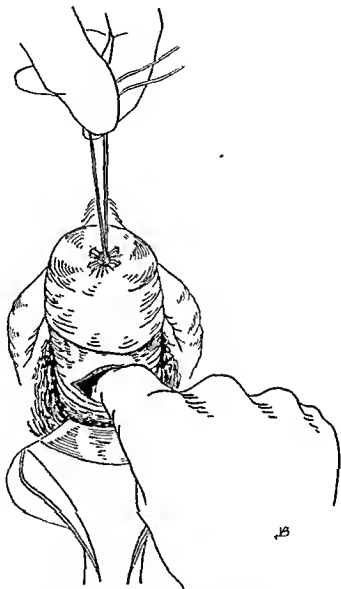


Fig. 162.—Enlarging the opening in the utero-rectal pouch.

sufficient tissue being grasped to include the cervical branches of the uterine vessels, care being taken not to apply the forceps too far out, because of the danger of including the ureter. The broad ligament between the forceps and supra-vaginal cervix is now divided with blunt-pointed scissors (Fig. 164). The uterus having been drawn over to the opposite side, a similar procedure is followed, the cervical branches

of the uterine vessels being clamped and the base of the broad ligament divided.

x. Clamping and dividing the main uterine vessels.—The uterus being pulled farther down, a pair of pressure forceps is applied to the next section of the broad ligament, including the main uterine vessels which run in it. This section is now divided between the forceps and side of the uterus. A similar procedure is then repeated on the opposite side (Fig. 165).



which surrounds the cut end of the round ligament, after which the cervical branches of the uterine vessels are secured by a ligature (Fig. 168).

Lastly, a second mattress-suture is inserted between the first one and the ligature securing the cervical branches of the uterine vessels, and thus the remainder of the cut edges of the broad ligament and main uterine vessels are secured (Fig. 169). The ligatures and sutures

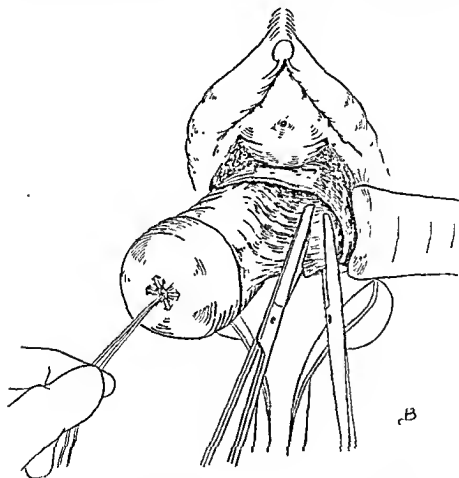


Fig. 164.—Division of the lower part of the broad ligament.

are left, for the time being, hanging out of the vagina, their ends being clamped with pressure forceps.

xiii. Inspecting the stumps.—When all the ligatures are tied, the stumps should be pulled down and inspected to see that bleeding is not taking place. The ligatures should then be cut short. Unless the Fallopian tubes and round ligaments are firmly secured, these may retract, causing the ligature to slip, and giving rise to troublesome bleeding which may be somewhat difficult to control.

Since the ligatures employed in vaginal hysterectomy almost

invariably separate and are passed *per vaginam*, the relative advantages of silk and catgut are not materially different.

Silk has this advantage, that, its knot being the more secure, it is less likely to be pulled off when the pedicles are drawn down for inspection.

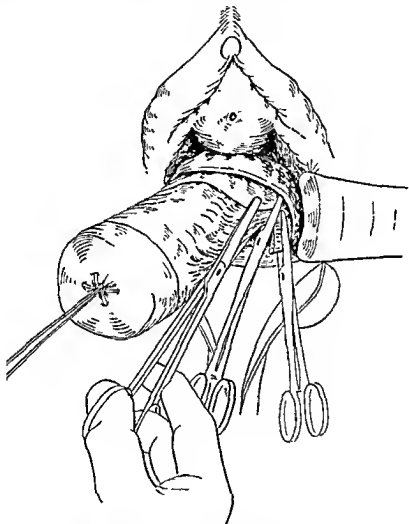


Fig. 165.—Division of the uterine artery.

If the vessels have been properly secured, there is no oozing from the stumps. If any oozing is present, the bleeding area is re-secured with pressure forceps and re-ligatured. If the open mouth of the cut end of the uterine artery can be seen, it should be picked up with pressure forceps and ligatured separately. Exactly how many ligatures will have to be applied on each side will vary with the skill of the

operator and the size of the uterus; but the cut edge of the broad ligament must be rendered quite bloodless, and if there is any oozing the part where it occurs must be re-ligatured.

The vagina is now thoroughly swabbed with iodine or Violet-green, and the swab in the utero-rectal pouch is then removed.

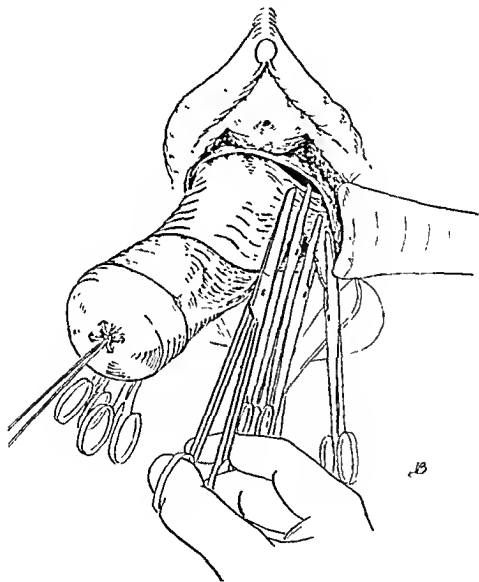


Fig. 166.—Division of the upper part of the broad ligament.

xiv. Treatment of the vaginal vault.—The lateral angles of the vaginal incision should now be closed by mattress-sutures picking up not only the vaginal wall but the anterior and posterior peritoneal edges as well (Fig. 170). The centre of the incision is left open for drainage, which is

provided by passing into the utero-rectal pouch a piece of gauze soaked in 1-1,000 flavine with which the vagina is also lightly packed. The gauze should be removed in 24 hours.

Difficulties. i. Separating the bladder.—Sometimes a good deal of

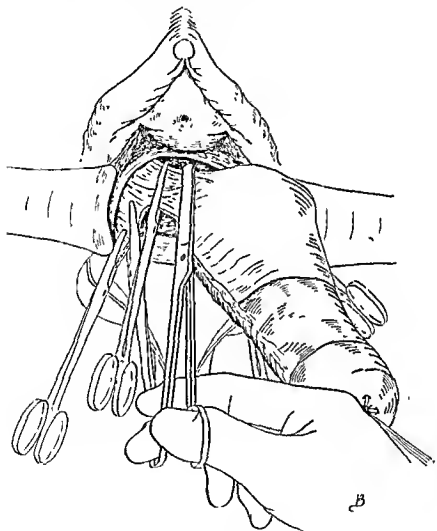


Fig. 167.—Separating the uterus.

trouble is experienced in separating the bladder. This may be due either to the fact that the operator when using the scissors cuts into the muscle of the cervix instead of through the loose connective tissue, or to the connective tissue being denser than normal.

In the first event, if the operator fails to recognize what he is doing, he may open the cervical canal.

If dense connective tissue is preventing the proper separation of the bladder, it must be divided by a series of small cuts, made with the scissors held on the flat, till looser connective tissue is reached.

ii. Opening the utero-vesical pouch.—Another difficulty may present itself on an attempt being made to open the utero-vesical pouch.

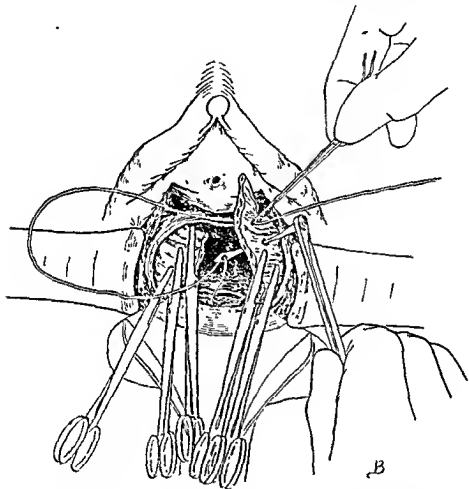


Fig. 168.—Securing the vessels in the upper part of the broad ligament.

The reason is twofold. Either the operator, if inexperienced, is uncertain when his finger has reached the peritoneum, and is somewhat timid in using the scissors; or, what is more probable, the forefinger of the left hand pushes the peritoneum in front of it so that it is continually running away from him.

A useful method of identifying the peritoneal reflection is to rub what you take to be it against the anterior surface of the uterus, when, if the tissue is the peritoneum, it will slip about on the uterus with an oily sort of feeling.

If, on the other hand, the operator experiences difficulty in steadying the peritoneum during its incision, a pair of long forceps can be passed up guided by the forefinger till the peritoneum is reached, when this membrane can be clamped and then pulled down and dealt with. An additional help may be gained by means of a long narrow retractor pushed up between the bladder and the cervix. Lastly, the opening

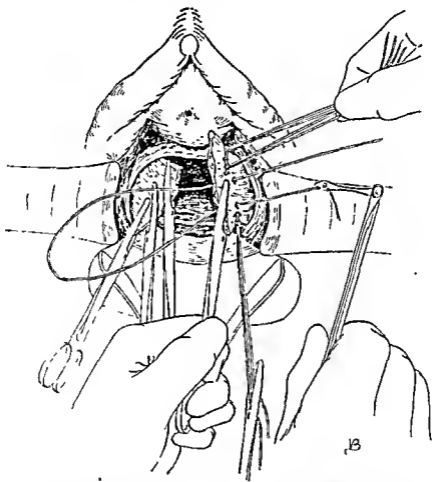


Fig. 169.—Securing the vessels in the lower part of the broad ligament.

of the utero-vesical pouch can be postponed until Douglas's pouch has been opened, when the index and middle fingers of the left hand can be passed into it up along the posterior surface of the uterus, over the edge of the broad ligament, and so to the utero-vesical reflection, when the peritoneum can be incised as it rests against the fingers.

iii. Opening the utero-rectal pouch.—If the posterior incision is made with a scalpel, and the mucous membrane then separated with

its handle or the forefinger, the cellular tissue between the vagina and rectum may be opened up and the vagina separated from the rectum for some distance before the mistake is discovered.

iv. Bleeding from the cut vagina.—The posterior cut edge of the vagina and peritoneum is much more vascular than the anterior, and the oozing of blood that takes place from its surface may be very trouble-

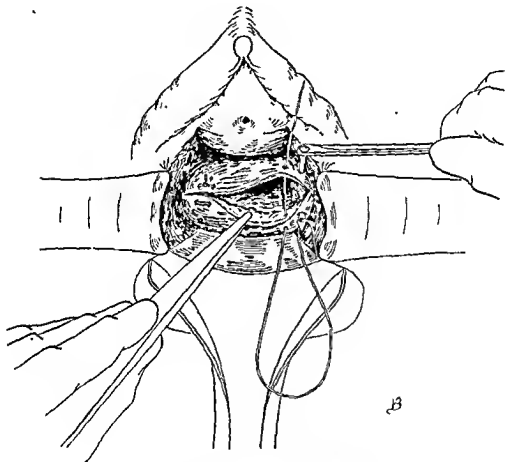


Fig. 170.—Inserting sutures in the vagina.

some both during the removal of the uterus and afterwards. The same difficulty may present itself with the anterior flap, though in a lesser degree.

This oozing, especially if it comes only from one or two points, can be temporarily stopped by pressure forceps. A better way to check the oozing, if it is at all troublesome, is to obliterate the raw surface of the flap by suturing the peritoneum to the mucous membrane with a continuous catgut suture.

v. Narrow vagina.—If the vagina is narrow, as in virgins or in women

who have not borne children, the operation becomes more formidable, and the operator, unless he be very expert, may find great difficulty in passing and tying the ligatures for want of sufficient room. In these cases it is a great help to perform a paravaginal section (Fig. 171). This is effected by incising the vagina along the junction of the posterior

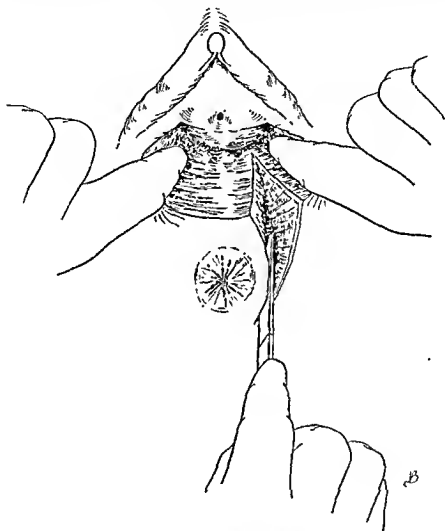


Fig. 171.—Paravaginal section.

and left lateral walls from the vault downwards, and then carrying the incision backwards through the skin around the rectum towards the coccyx, the anterior fibres of the left levator ani being divided (Fig. 171). A good deal of bleeding ensues, which must be checked by ligatures and the pressure of the Auvard speculum. At the conclusion of the operation the wound is sutured.

vi. Applying the upper clamps.—After division of the base of the broad ligaments, it may be found that the uterus cannot be pulled down properly, and in that case much difficulty may be experienced in applying the upper clamps. This difficulty will be due either to

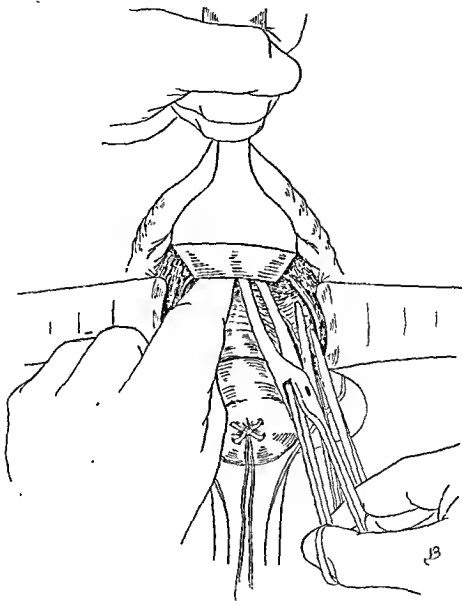


Fig. 172.—Anteflexing the uterus.

infiltration of the surrounding connective tissue by cancer spreading from the body of the uterus, or inflammatory products, in which case it may be impossible to finish the operation from the vagina; or to the presence of adhesions, or to the large size of the uterus.

Infiltration of the broad ligaments should have been discovered

before the operation was started, by pulling the cervix with the volsellum down to the vulva and examining the broad ligaments and the paracervical tissue *per rectum*. If the cervix cannot be drawn down to the vulva, this in itself is an indication that the operation on the

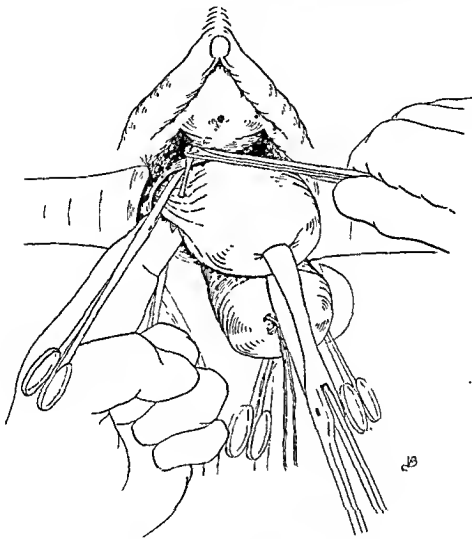


Fig. 173.—Securing the ovarian vessels after anteverting the uterus.

ordinary lines will be a failure, and that the paravaginal incision will have to be used, or the uterus removed by the abdominal route.

If the difficulty is due to adhesions, they should be gently broken down, and if the Fallopian tubes or ovaries are diseased, these should be removed by placing the upper clamp outside them, i.e. round the ovario-pelvic ligaments.

If the difficulty is due to the size of the uterus, this can be surmounted in one of two ways:

(1) As much of the lower part of the broad ligament as possible having been divided, a retractor is inserted between the bladder and

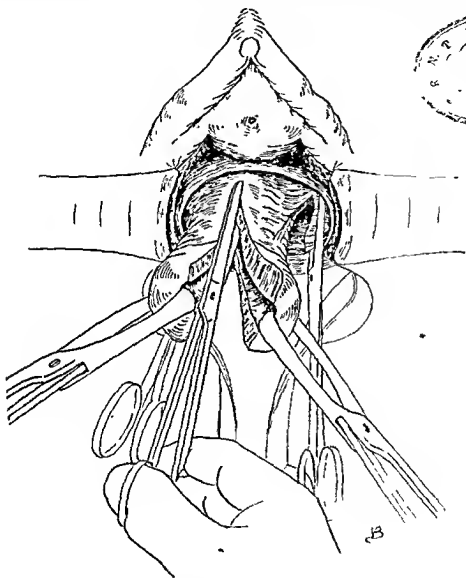


Fig. 174.—Bisecting the uterus.

the anterior surface of the uterus. The fundus of the uterus is seized with a volsellum and, the uterus being anteverted, is delivered through the utero-vesical incision (Fig. 172), when the upper border and posterior surface of the broad ligaments come into view and that portion of the broad ligament, ovarian vessels and Fallopian tubes is clamped and then ligatured, as before (Fig. 173).

(2) If the uterus is still too large to be delivered by the foregoing method, the suture closing the cervix is removed and a pair of volsella is attached to the cervix on each side, one blade of each being in the

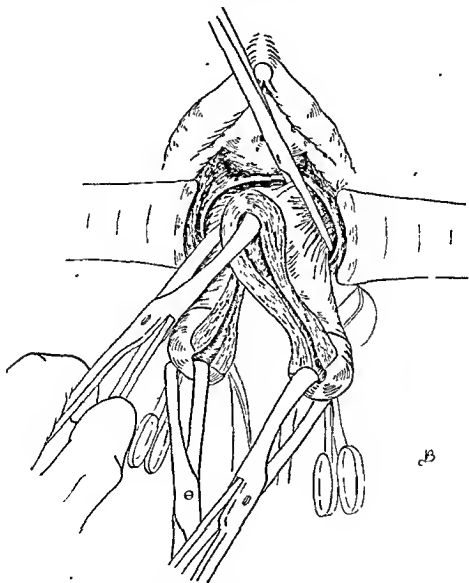


Fig. 175.—Removing one half of the uterus.

cervical canal and the other on the outside of the cervix. The uterus is then gradually bisected from below upwards with a pair of strong blunt-pointed scissors (Fig. 174).

The uterus thus being bisected, a third volsellum is attached to the fundus of one half and pulled down. It will be found that the

upper part of the broad ligaments is much more easily brought into view. Clamps being applied on one side, that half of the uterus is cut away, the other half being treated similarly (Fig. 175).

vii. *Ligature impossible.*—When the vagina is very narrow and the tissues are rigid, it may be impossible satisfactorily to replace the clamps by ligatures. In such cases it is better not to attempt it, but to leave the clamps *in situ* for 72 hours or longer.

Dangers. i. *Wounding the bladder.*—This is, perhaps, the commonest accident associated with vaginal hysterectomy. Although at times its avoidance would appear to be well-nigh impossible, since this accident now and again happens to the most expert operators, nevertheless the liability to its occurrence can be reduced almost to a vanishing point if, during the separation of the bladder, the operator keeps careful note of its position with the bladder-sound. There is much greater danger of this organ being wounded if it contains urine. This is the reason why the operator should pass a catheter himself before making the first incision, for, although the nurse may have emptied the bladder before the operation, it is a fact well-known to most medical men from the days of their earliest professional examinations, that the kidney rapidly secretes urine under the influence of fright or anxiety. If the bladder is opened, it must be sutured by the method described at p. 777.

ii. *Wounding the bowel.*—If, when incising the posterior fornix with the scissors, the points are directed too far backward instead of in the line of the uterus, the rectum may be wounded, and it may also be wounded if the cellular tissue between the vagina and the rectum is opened up.

The small intestines or omentum, if they lie low in the utero-rectal pouch, may be wounded if care is not taken when cutting into it. If the bowel is wounded, it must be at once sutured according to the method described at p. 782. A fecal fistula may result, which, however, as a rule, eventually closes.

iii. *Oozing.*—At times, although serious bleeding is absent, some oozing may take place from one or other of the cut surfaces, in which case it may be found that this oozing will be better controlled by clamping the raw surface with a pair of long pressure or ring forceps, instead of ligaturing it. The forceps should be removed in 48 hours.

iv. *Injury to ureters.*—As the ureter is less than an inch from the cervix at the point at which the uterine vessels are ligatured, there is a risk of its inclusion, or it may be cut during the division of the lower part of the broad ligament. The importance of keeping as close to the uterus as possible when applying the lower clamps and passing the lower ligatures is therefore obvious.

This accident, unfortunately, is not so very uncommon. If both

ureters are occluded the patient will die of anuria unless the obstruction is removed. If they are injured a ureteral fistula is the result. Nothing may be noticed for some days if the ureter has been tied as well, but when the ligature separates, urine commences to dribble from the vagina.

The dribbling urine may be attributed to a vesical fistula, but with the latter most of the urine dribbles away, whereas if the escape of urine is due to a ureteral fistula the urine on the sound side will collect in the bladder. If there is any doubt as to the cause of this complication, a solution of boric acid, coloured with methylene blue, can be injected into the bladder, and its presence ascertained by placing a wool swab in the vagina. As one of the methods of treatment for a ureteral fistula is to remove the kidney of the corresponding side, it will be seen how important it is to examine the bladder with a cystoscope so as to determine for certain which ureter has been injured. We know of a case in which the failure to take this precaution resulted in the wrong kidney being removed.

v. **Bleeding.**—There is always a certain amount of oozing from the cut surfaces after the operation, but if the bleeding is at all free, either a ligature has slipped or some vessel which did not bleed during the operation has started doing so. In either case the bleeding spot must be religatedured or, if this is impossible, a ring forceps should be applied and left on.

vi. **Implantation of cancer-cells.**—The operation of vaginal hysterectomy as just described is not applicable to cases of carcinoma of the cervix because of the impossibility of preventing the implantation of cancer-cells on to the cut surfaces. If it is desired to treat carcinoma of the cervix by vaginal removal, the operation of Schauta should be performed.

If carcinoma of the body is present, great care should be taken entirely to suture up the external os before commencing the operation. In any case of malignant disease it is most important not to cut into the uterine wall while removing it. Some of these cases present a condition of pyometra, and it is important to pass a sound into the cavity, to evacuate any pus that may be there, before starting to remove the organ.

Removal of the appendages.—In all cases in which the operation is performed for carcinoma of the body of the uterus, the Fallopian tubes and ovaries should be removed, as also in septic cases and in all other conditions in which they are obviously diseased; otherwise they should be spared, since their removal increases the difficulty of the operation owing to the inaccessibility, in some cases, of the ovario-pelvic ligament. It is occasionally good practice to postpone their removal until the uterus has been cut away.

After-treatment.—See p. 800 and Chapter xxx. The gauze packing is removed from the vagina in 48 hours. At the end of a week antiseptic vaginal douches should be given at low pressure until all discharge has ceased. If forceps have been left on, instead of ligaturing the pedicles, they should not be removed for at least 3 days. It is a good plan to precede the actual removal by freeing the ratchet for 24 hours.

The patient gets up, if she has progressed normally, in 2 weeks.

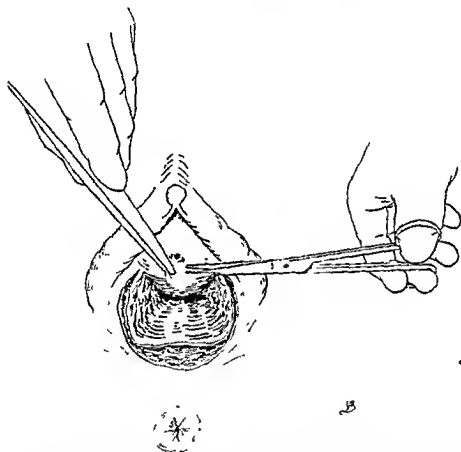


Fig. 176.—Hystero-vaginal: Separating the lower end of the vagina.

RADICAL HYSTERO-VAGINECTOMY BY PARAVAGINAL SECTION

Indications.—This operation has been extensively performed by certain Continental surgeons as a routine treatment for carcinoma of the cervix. We have fully discussed its merits in the chapter dealing with the radical abdominal operation for this disease (Chapter xvi).

We ourselves, while preferring the abdominal route for most cases of carcinoma of the cervix, are of opinion that the vaginal route may rightly be chosen when the patient is very fat, the uterus small, and

the vagina capacious. Further, we have employed this operation for cases of carcinoma of the body of the uterus with metastatic growth in the vagina in which the uterus was freely movable and there were not any signs of any other extension of the disease. It is also indicated in certain cases of primary carcinoma of the vagina.

Preparation of the patient.—See p. 76.

Instruments.—The same as for vaginal hysterectomy (p. 274).

Operation.—The following are the steps of the operation :

i. Separation of the lower two inches of the vagina.—An incision is made round the mucous membrane of the vagina, at its junction with

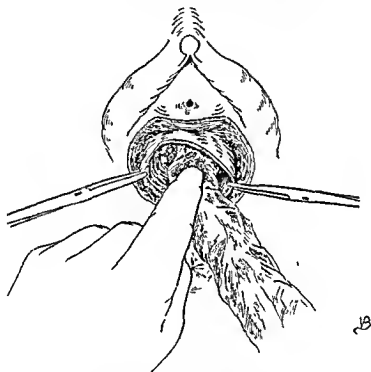


Fig. 177.—Packing the vagina.

the vulva, with a pair of scissors (Fig. 176), after which this canal is freed for its lower two inches by forceps and scissors.

ii. Packing the vagina with gauze.—The vagina is then packed with flavine gauze (Fig. 177).

iii. Closing the vagina.—The cut edges of the vagina are now closely approximated with interrupted sutures of No. 4 silk; the ends of the sutures are left long to form a tractor (Fig. 178).

iv. Continuing the separation of the lateral and posterior vaginal walls.—The sutured end of the vagina is then pulled upwards by means of the sutures and the vagina is separated from the rectal wall by the finger and, if necessary, by the pressure of a swab on the end of

the index finger of the right hand, the vagina being pulled in different directions as may be convenient, by means of the ligatures held in the left hand (Fig. 179). The side attachments (the cardinal ligaments) require division with scissors.

v. *Paravaginal section.*—A broad retractor is now inserted between the posterior vaginal wall and the rectum, and the cut end of the vagina is retracted to the left of the operator. A deep incision is then made with a scalpel along the length of the vaginal bed on its left side and

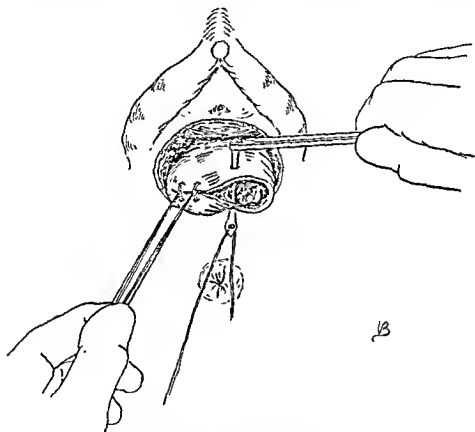


Fig. 178.—Closing the vagina.

through the skin to the left side of the rectum and around it towards the coccyx, the anterior fibres of the levator ani being divided, with the result that the wound gapes to a marked degree and sufficient room is obtained for further manipulations (Fig. 180).

This incision may give rise to very brisk hæmorrhage, which must be arrested by ligaturing any individual vessels which are seen spouting, or applying mattress-sutures to any surfaces where there is marked oozing.

vi. *Opening the recto-uterine pouch.*—Auvard's speculum is now inserted into the wound, and, the freed end of the vagina being held forwards by the assistant, the peritoneal reflection at the bottom of

Douglas's pouch is seized with pressure forceps and snicked through with scissors, after which a large swab with a tape affixed is placed in Douglas's pouch to prevent the bowels from prolapsing.

vii. Separating the bladder, exposing the ureters, and opening the utero-vesical pouch.—The vagina being pulled well down by an assistant,

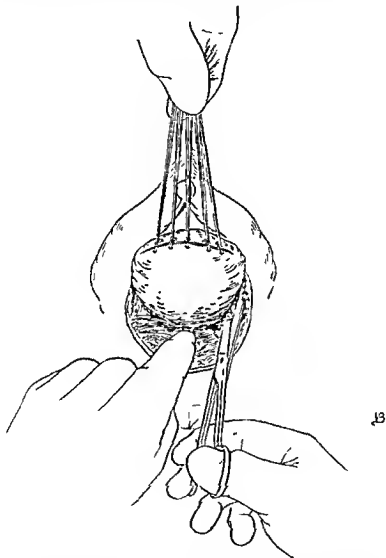


Fig. 179.—Dividing the lateral attachments of the vagina.

the bladder is separated by a few judicious snips with the scissors, aided by the handle of the scalpel and swab pressure, until the ureters come into view (Fig. 181). These should now be separated as far as possible with the index finger from the paravaginal and para-uterine tissue. The identification and separation of the ureters is rendered

more easy if the bladder is well separated laterally. A broad retractor is now hooked under the bladder, which is dragged against the pubes,

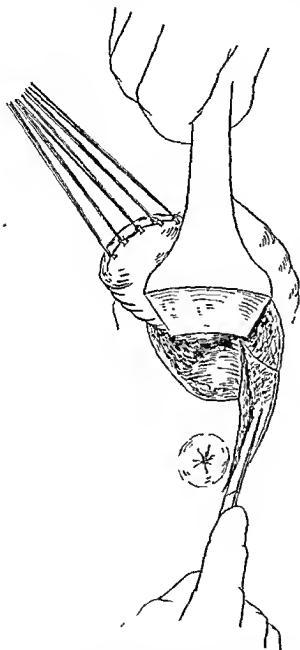


Fig. 180.—Making the paravaginal incision.

and, the utero-vesical reflection of peritoneum having been seized with pressure forceps, the pouch is opened with scissors.

viii. Clamping the uterine vessels.—An assistant pulls the vagina well over to the right side of the patient, and while another holds the bladder well back the operator passes the index finger of his left hand behind

must be lightly irrigated with a solution of peroxide of hydrogen, 10 volumes. If there is much œdema or sloughing of the external skin, hot fomentations should be applied. The bladder will probably have

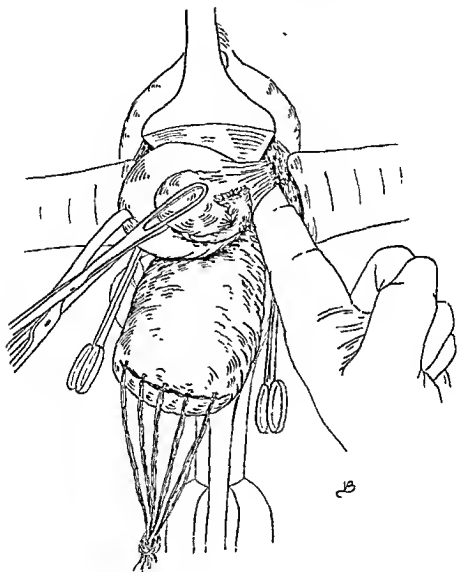


Fig. 183.—Delivering the fundus of the uterus.

to be catheterized for some days until it regains its power. Urotropin or some other urinary antiseptic should be given by the mouth. The stitches closing the paravaginal incision externally should be removed in a week. The period of convalescence will be a long one, owing to the time taken for the cavity to close. The epithelium from the

surface tends to grow inwards, so that eventually a short, very narrow pseudo-vagina may be formed.

Dangers and difficulties.—The operation is a very formidable one, and should not be attempted except by those accustomed to vaginal hysterectomy, than which it is *much more difficult*. The oozing from the vaginal bed and paravaginal incision is extremely free, and, apart from the ligating of any special vessels, the operator will have to rely upon the pressure of the retractors to keep it in check until the sutures are inserted. Great care must be exercised, when separating the bladder and rectum, to avoid injuring these structures. The ureters are also in special danger of being wounded unless great care be taken to define them.—The bowel has a special tendency to prolapse. In some cases it may be very difficult to replace the clamps with ligatures, in which case they should be left on for 4 or 5 days. To counter shock and hæmorrhage a canula should be inserted into a vein before the operation is begun and blood transfusion started so soon as seems necessary.

CHAPTER XII

OPENING AND CLOSING THE ABDOMINAL CAVITY

Instruments required.—The instruments generally required for abdominal operations are the same in all cases. It will be convenient, therefore, to set them forth in a list to which the reader will be referred from other chapters. When any special instrument is required it is mentioned at the beginning of the respective section.

A scalpel.

Ten long Spencer Wells pressure forceps.

Two ring forceps.

Two Bonney's dissecting forceps.

Two volsella.

Two blunt-pointed scissors, angular scissors, one single-handed scissors.

One bladder-sound.

Berkeley and Bonney's self-retaining retractor.

Two pieces of sheet rubber, one sheet rubber round-about*, eight curved needles (Bonney's)—two No. 3, two No. 7, two No. 13, and two 5-inch.

One straight 4-inch needle and Michel's clip apparatus.

One Reverdin's needle.

Six small towel clips.

Two Moynihan towel clips.

One Gray's towel clip.

Two reels of silk, Nos. 2 and 4.

Two Bonney's wrist reels.

Catgut No. 1 (20-day), plain catgut No. 0, and silkworm or nylon gut.

Rubber drainage-tube, two sizes, $\frac{1}{4}$ inch and $\frac{3}{4}$ inch.

A silver female catheter.

Opening the abdominal cavity.—The following are the steps of this procedure :

i. **Skin-incision.**—The length of the skin-incision must necessarily depend both on the reason for which the abdominal cavity is being opened, and on the amount of fat in the abdominal wall. Thus it will obviously be shorter in those cases in which the abdominal cavity is being opened to evacuate ascitic fluid, when ventralfixation of the uterus is contemplated, and in the case of an ovarian cyst when

* Waterproof batiste does as well and is more pliable.

after investigation, it is decided to evacuate its contents before removal. Alternatively the incision may be unusually long, reaching almost up to the xiphisternum, in the case of an ovarian cyst when,

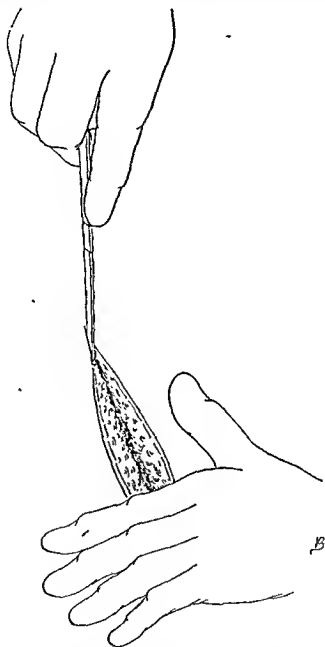


Fig. 184.—Opening and closing the abdomen: Incising the skin.

from the appearance of the tumour, or for some other reason, the operator decides to remove the cyst without tapping. An incision about 5 inches, and situated between the umbilicus and the symphysis pubis in the mid-line, will suffice for the removal of most uterine or

ovarian tumours or for most cases of diseased tubes. In the operations for Cæsarean section by the classical method, or for the radical removal of carcinoma of the cervix, the incision may extend beyond the umbilicus. Preparatory to the incision, on the supposition that the operator stands

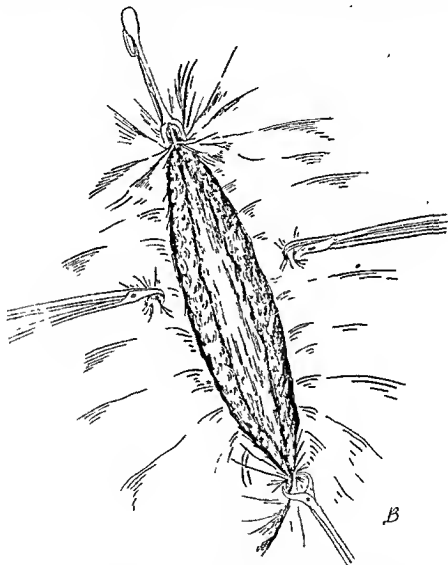


Fig. 185.—Round-about of rubber sheeting attached to the skin.

on the right side of the patient, he steadies the abdominal wall with his left hand, the thumb resting on the right of the median line and the fingers on the left (Fig. 184), while with his right hand he delineates the upper border of the symphysis pubis to ensure that the lower end of the incision shall not be carried too far. It may be necessary to clamp a few bleeding-points, and notably two may require ligature

owing to the division of a small transverse artery three-quarters of an inch above the symphysis pubis.

This oozing from the cut edges will be more marked if the patient is exsanguinated from any cause, if the tumour is or has been inflamed,

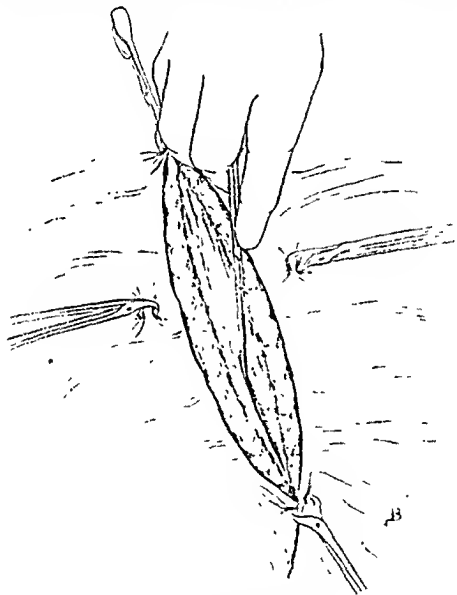


Fig. 186.—Incising the fascia.

if it is malignant, or if the patient is taking ether and is much cyanosed; the vessels should be ligatured with catgut.

The surgeon should take care that the incision is accurately in the middle line, remembering that the scar will remain as a permanent record of his skill or clumsiness. Some surgeons employ what is termed the paramedian incision, apparently under the impression that the resulting tear is stronger. There is no ground

for this contention, while the resultant scar is just sufficiently asymmetrical to make it look offensive to those whose æsthetic sense is keen.

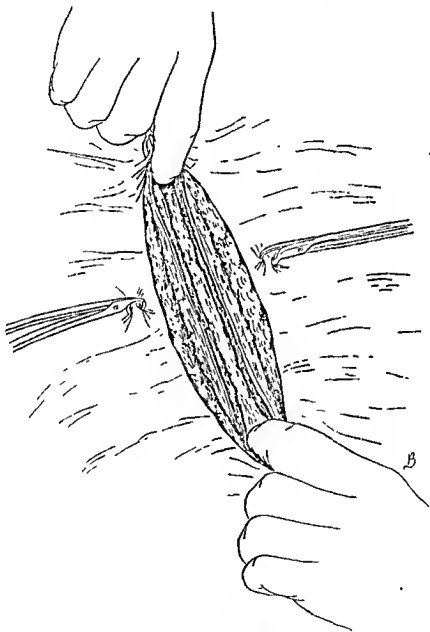


Fig. 187.—Separating the recti.

In those cases in which a loss of blood may be an important factor before the termination of the operation, notably in the radical operation for cancer of the cervix, it is very important to arrest any oozing of blood as it occurs.

ii. Application of the rubber round-about.—The round-about of sheet rubber is now attached to the skin at the pubic end by Gray's forceps, at its upper end by a small towel clip, and laterally by two Moynihan's forceps. We prefer to apply these two latter in the manner shown in Fig. 185, so as to have a good fringe of the rubber overhanging the edges of the wound.

iii. Fascial incision and separation of the recti.—The linea alba is next incised (Fig. 186), and a streak of fat should mark the inter-rectal space. If this line of demarcation is not apparent, the incision should be enlarged for 2 inches or so, when it will be found that the cut edge of the fascia can be separated from the underlying muscle with the dissecting forceps more easily on one side than the other. The incision already made should then be extended towards that side where the cut edge is most adherent, this indicating the position of the inter-rectal space. When the inter-rectal space is identified the recti should be separated for the entire length of the incision by placing the forefinger of each hand in the wound and abducting them (Fig. 187). An alternative method is to incise the sheath of the rectus and cut directly through the muscle, or separate the fibres by inserting the points of the scissors between them, which is perhaps the better method as it does not cause so much oozing. Those surgeons who divide the muscle-layer by these means do so either because they think there is less chance of a resulting hernia, or because on failing to find the line of separation when first incising the fascia they will not trouble to seek for it further. With regard to the fear of a subsequent hernia, we do not think this need be considered, since we have known hernia occur after both methods. And we are further of opinion that there is a distinct disadvantage in cutting through the muscle, since not only is there apt to be a good deal of troublesome oozing from the torn vessels, but also the incision cannot be so satisfactorily retracted, and the complaint of pain in the abdominal wound during the first few days after the operation is more marked.

In some cases, on incising the linea alba and separating the recti, one or two veins running transversely from under the posterior layer of the sheath will be divided, and the cut ends will need ligature. Vessels also may be torn if, in an endeavour to find the inter-rectal space, the operator separates the fascia from the underlying muscle too freely, and these will require ligature.

iv. Peritoneal incision.—After the recti and subperitoneal fat have been separated by the index-fingers, the shiny peritoneum appears, and in most cases no difficulty is experienced in its recognition, since the remains of the obliterated hypogastric artery can be seen as a white cord running through the membrane.

The peritoneum is now lightly picked up on the left of the median line with pressure forceps which are handed to the assistant, or the assistant

may clamp it himself, while on the right of the median line the operator holds the peritoneum with a pair of dissecting forceps.

The peritoneum is then stretched between the forceps, slightly raised, and carefully nicked so that air can enter and displace any

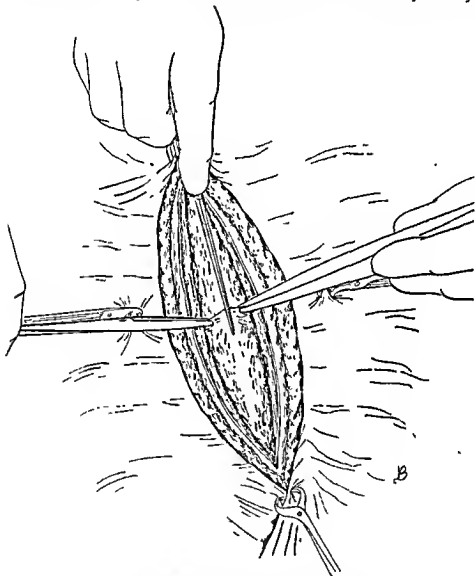


Fig. 188.—Incising the peritoneum.

intestines or omentum that may be lying in close apposition, and which otherwise, if a deliberate incision is made, may be wounded (Fig. 188). An additional method of obviating this risk is to give that piece of peritoneum which is held by the dissecting forceps a little shake before nicking it, when any intestine or omentum not adherent may be displaced.

The abdominal cavity having been opened, the peritoneum is divided along the entire length of the wound towards the pubic angle by inserting under the peritoneum the first and second fingers of the left hand, palmar surface uppermost (Fig. 189), and cutting between

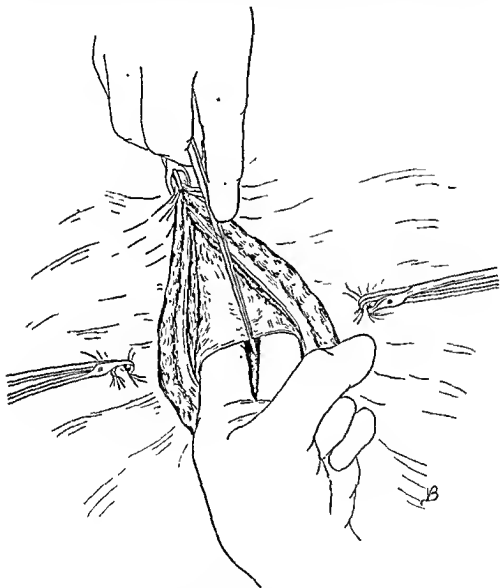


Fig. 189.—Enlarging the wound towards the pubes.

the two; and towards the opposite angle by raising it with the index-finger of the left hand, palmar surface uppermost, directing the assistant to do likewise on his side, and then cutting it (Fig. 190), in each case avoiding the veins which at times are found running vertically towards the pubes.

If there appears to be any danger of wounding the bowels or

omentum during this division, a swab may be placed over them first.

v. **Introduction of the retractor.**—The abdomen having been opened to the fullest extent required, the operator must decide whether or not he will insert the self-retaining retractor. When there is not a large

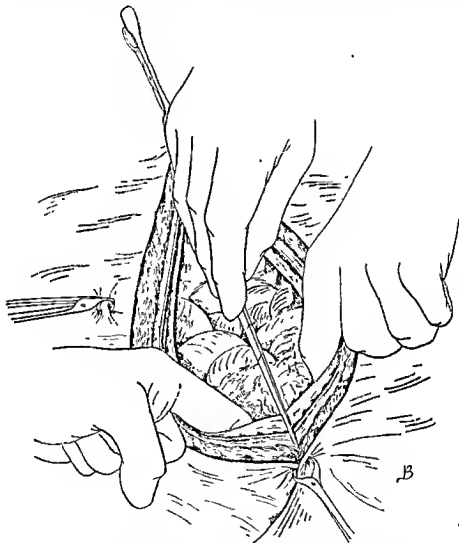


Fig. 190.—Enlarging the wound towards the umbilicus.

tumour to be removed he should certainly do so, and thus secure the maximum amount of light and vision at the outset of the operation. In the case of large tumours, however, it will be necessary to remove the mass first and insert the retractor afterwards. The rubber sheeting attached to the retractor covers the entire edges of the abdominal wound and thus protects it from infection from within (Fig. 191).

vi. **Packing off the intestines.**—The intestines and omentum having

been displaced towards the diaphragm, away from the area of the wound, two or three of the small swabs are inserted below them to prevent their dropping back again (Fig. 191). We find this, as a rule, better

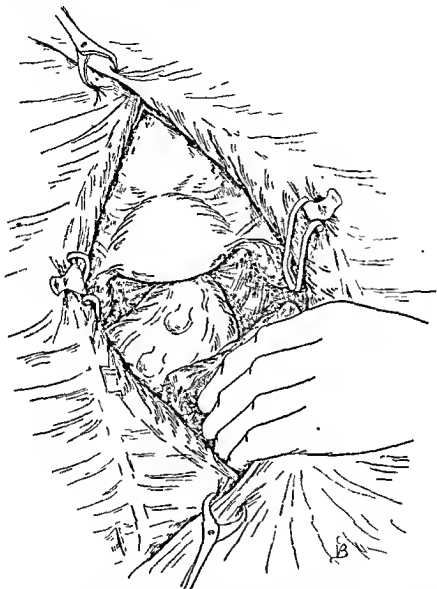


Fig. 191.—The Berkeley-Bonney retractor in position with rubber sheeting attached to it, and a swab being inserted.

than using one large swab, though in exceptional circumstances the latter may be required. They should be soaked in saline solution.

Difficulties and dangers.—Sometimes, after the recti have been separated, difficulty will be experienced in recognizing the peritoneum, or in making an opening into its cavity, while in some cases there is a danger of wounding the subjacent organs. There may be several

reasons for this, which will be discussed under the following headings :

i. **Subperitoneal tissue.**—In certain cases, in which the peritoneum is adherent to an underlying tumour, the deeper layers of the subperitoneal tissue may be mistaken for the peritoneum, while the peritoneum is mistaken for the surface of the tumour, and under these conditions the operator, thinking that the tumour is adherent to the peritoneum, may endeavour to separate it, and will in reality be stripping the peritoneum itself from the subperitoneal tissue. In doing so he may tear one or more veins, which may disappear from view, their injury being demonstrated by oozing of venous blood. It is important to discover and ligature the ends of the veins with catgut, otherwise a troublesome hæmatoma may result. It is useful to remember that at the umbilicus the peritoneum and subperitoneal tissue cannot be separated.

ii. **Bladder.**—This organ may be so distended that it presents in the wound or may be so dragged upon by a tumour that it reaches half-way up the wound, or even higher, and if it is not at first recognized, the bladder may be opened or difficulty will be experienced in attempting to open the peritoneal cavity. Suspicion may be aroused on discovering that the tissue presenting after separation of the recti has a fleshy appearance differing from that of the shiny membranous peritoneum, and also that when a small cut is made into it marked venous oozing occurs, an almost sure sign that the bladder is being wounded. This difficulty and danger may generally be avoided by inquiring of the nurse, before any abdominal operation, whether she has found any difficulty in catheterizing the patient, an answer in the affirmative being a forewarning; or best of all by the surgeon making a practice of himself passing the catheter when the patient is on the operating table.

The bladder may be wounded when the peritoneal opening is being enlarged towards its lower end, which accident may be prevented by holding up the peritoneum and looking at it through its inner surface, when the limitation of its transparency will indicate the position of the bladder. If the bladder is opened, it should be at once closed according to the methods described elsewhere (p. 777).

If there is reason to suspect that the presenting tissue is bladder, the attempt to open the peritoneal cavity at that point should be abandoned, and a point nearer to the umbilicus should be selected. In the more difficult cases a sound should be passed into the bladder which will indicate the upper limit of its distension.

iii. **Intestine or omentum.**—If the intestines are much distended with gas, if they or the omentum are adherent to the parietal peritoneum, or if both are floated up by free fluid in the peritoneal cavity,

there is danger, unless care be exercised, that one or other will be injured when the peritoneum is incised. When it appears that any of these conditions may be present, only the smallest nick should at first be made in the peritoneum, and that very carefully. If the air does not then sufficiently separate the peritoneum from the abdominal contents, the opening must be carefully enlarged with a blunt-pointed scissors until a finger can be inserted and any adhesion separated, fluid evacuated, or a swab introduced between the peritoneum and bowel, as the case may be. If the omentum is wounded the bleeding-points must be ligatured at once with thin silk, and if the intestine is injured it should be sutured according to the directions given on p. 782.

iv. Adherent tumour.—The tumour may be adherent to the parietal peritoneum. In the case of an ovarian cyst which has been inflamed and then become adherent to the parietal peritoneum there will be at times some difficulty in distinguishing the one from the other. We have known cases in which the peritoneum, having been mistaken for the cyst-wall, has been stripped off the parietes nearly up to the diaphragm before the error was discovered, with the result that sloughing took place at a later date.

To determine between peritoneum and cyst-wall may test the powers of even the most experienced operator, and the only way to obviate this danger is to remember that the condition just described may exist, and when, as in this or in any other case, there appears to be difficulty in opening the abdominal cavity, to try again at a higher point of the incision, or, if necessary, extending the incision upwards.

v. Size of opening in abdominal wall.—When the peritoneal cavity has been opened to deliver a tumour or to enable one to obtain a good view of the pelvic organs, it is important that the incision in the abdominal wall should be of sufficient size. There is a great tendency for most beginners, and even for many veterans, to make such an opening too small. As a result, any complications which present themselves are much more troublesome to deal with, and the operator loses valuable time *niggling about* in a confined space, only to be compelled in the end to enlarge the opening.

There is no greater tendency to a ventral hernia with a large opening than with a small one, and the operator will be well advised in most cases to make his first incision large enough for his needs.

The exact length depends upon the circumstances with which he has to deal. In the case of solid tumours the upper end of the incision, as a general rule, should be at least 2 inches above the upper end of the tumour. If, however, the tumour be very large, or there be doubts as to its removability, or its exact location, it is better to begin with an incision large enough only for adequate examination, and to enlarge it, or not, as the ascertained nature of the case may demand.

Similarly, in large fluid tumours, some of which are with advantage tapped before removal, it is advisable to begin with a moderate incision. It is lamentable to see the abdomen split from ensiform to pubes for a tumour which subsequent examination shows could have been adequately removed through a wound a third the length. In obese patients the size of the wound must be relatively large, while in those with thin or flaccid abdominal walls a much smaller opening will suffice.

In all operations requiring deep dissection at the bottom of the pelvis, such as that for the radical abdominal operation for carcinoma of the cervix, a free incision of the abdominal wall is necessary.

When enlarging the wound downwards, the linea alba may be incised right down to the bone, but the peritoneum should not be divided lower than a point an inch above the pubes. Apart from the possibility of wounding the bladder, such a procedure has the disadvantage of freeing this viscus to such an extent that it drops down upon the uterus and continually obscures the operator's view throughout the operation. This is especially baulking in deep operations in fat patients. If the bladder does drop down, it should be fixed in its original position by stitching it to the lower angle of the divided linea alba.

vi. Treatment of the umbilicus.—If it is necessary to enlarge the wound above the umbilicus, the incision should be carried straight through that structure and the two halves should be freed from their attachments to the peritoneum and fascia by light touches with the scalpel (Fig. 192). To each half of the umbilicus a pair of forceps should be attached so that the halves remain everted until the time arrives to close the abdominal wound, when the umbilicus should be restored in the manner described on p. 291. This is a much better procedure than cutting out the umbilicus, which results in hideous deformity, or cutting round it which makes the wound difficult to suture satisfactorily.

vii. Scar of a previous abdominal operation in the mid-line.—Such a scar may be a good one, or it may have resulted in a keloid, or it may be ugly, or weak, or both. In the two latter cases it should be excised. In either case it must never be forgotten that, as a result of the previous operation, bowel or omentum may be adherent to the under surface of the parietal peritoneum and is in danger of being wounded during the necessary incision. In cases in which such may be anticipated it may be wise to open the abdomen above the upper end of the old scar.

Ventral or incisional hernia.—See p. 881.

Closing the abdominal wound.—This is effected in the following stages :

i. Adjusting the omentum and intestines.—Before proceeding to close an abdominal wound, the surgeon should see to it that the intestines

and omentum are in their proper positions, for the Trendelenburg posture displaces them upwards, and the packing off with swabs does likewise. The pelvic colon should be arranged so that its coils lie in the pelvis, and the small intestine should be distributed on the top of it. Lastly the omentum should be sought for and arranged apronwise over both. If this step is neglected, post-operative flatulence is encouraged and the risk of post-operative intestinal obstruction is increased (see pp. 825-848).

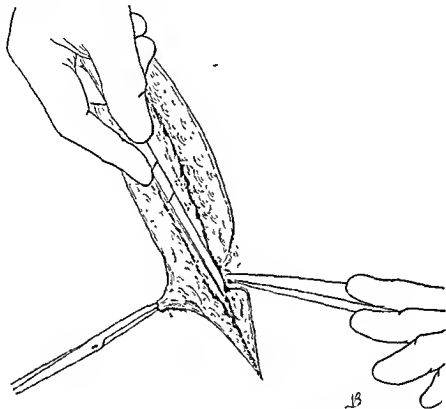


Fig. 192.—Reflecting the umbilicus after incising through it.

ii. Peritoneum.—The peritoneum is united by a continuous suture of No. 1 20-day catgut. The chief assistant should elevate the peritoneal edges by means of pressure forceps applied at each end of the incision. After the first stitch is tied, he removes the forceps at the upper end, and holds the thread taut, so as to prevent it from slipping during the insertion of each stitch (Fig. 193). Meanwhile an assistant keeps the peritoneal edges taut and raised by traction on the lower pressure forceps. This first stitch should be made to include not only the peritoneum but also the fascia at the upper end of the wound so as to secure a firm hold.

If the bowels cause trouble by bulging into the wound, so that they are in danger of being pricked, the peritoneal edges can be raised

by pressure forceps applied to them and a small swab may be placed over the bowels before suturing is started, care being taken to leave an opening sufficiently large to remove the swab before the layer is

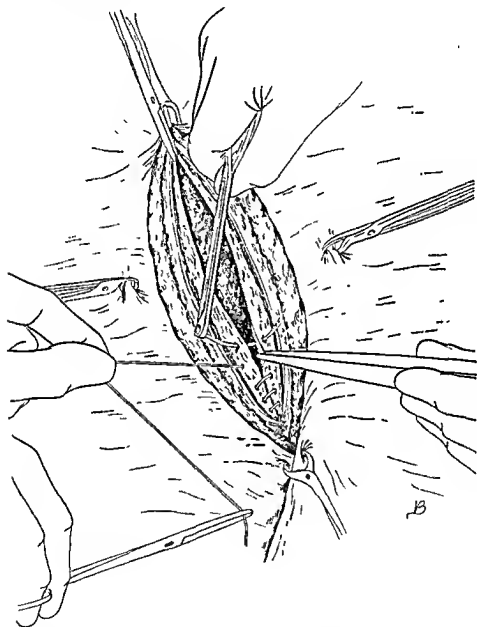
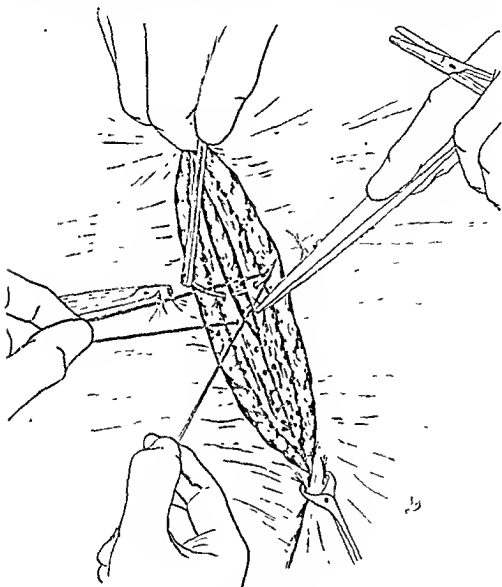


Fig. 193.—Suturing the peritoneum.

completely sutured. At times, after removal of this suture-swab, difficulty may be encountered in closing the small opening which remains, on account of the bowel bulging through the opening. This difficulty

will be successfully surmounted if, with the unclosed edges of the peritoneum lifted as high as possible, the suture is passed during expiration. Alternatively, the forefinger of the left hand can be passed into the wound, the gut depressed, and the suture completed above



● Fig. 194.—Suturing the fascia.

the finger, the catgut being drawn tight as the finger is removed. It is best to commence suturing the peritoneal layer at the umbilical end of the incision, because (1) it is the more difficult end to suture, especially in fat patients, and (2) if a suture-swab is being used, its withdrawal will not then disturb the omentum. In difficult cases it is well to insert the forefinger through the lower end of the peritoneal incision,

just before the suture is concluded, so as to make sure, by feeling along the suture line, that a piece of bowel or omentum has not been caught up by the suture.

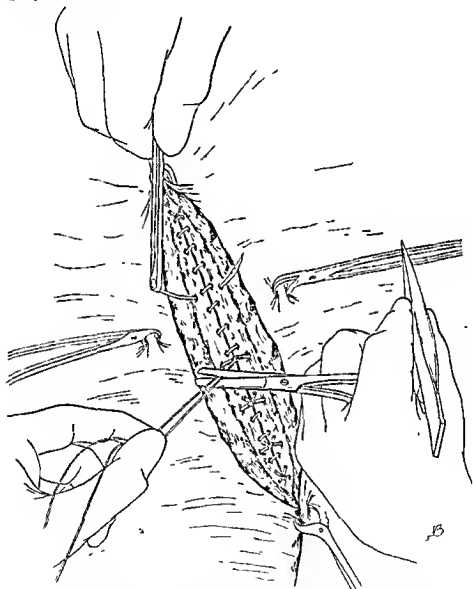


Fig. 195.—Inserting interrupted sutures in the fascia.

iii. Fascia.—The pressure forceps being removed, the fascial edges are next united with a continuous No. 1 20-day catgut suture, beginning at the upper end of the wound, the assistant holding the thread taut, for the same reasons as before (Fig. 194). In most cases we reinforce the continuous suture in the fascia by a series of interrupted sutures under-running the continuous suture (Fig. 195). These sutures may be

substituted by through-and-through sutures if the operator thinks fit, or may be omitted altogether when speed is a necessity, or the abdominal wall is lax.

In some cases, especially when the sutured peritoneum is loose and falls away markedly from the fascia at the pubic end of the wound, it is a good plan to pass one or two sutures through both peritoneum and fascia, thus bringing the two into apposition and closing the potential space into which blood might ooze and cause a hæmatoma.

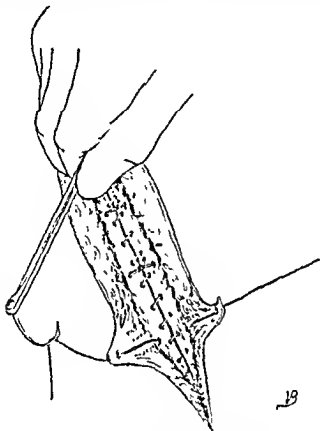


Fig. 196.—Restoring the umbilicus.

Some operators prefer to pass these hæmostatic sutures through all three layers, including the skin.

iv. *Fat*.—It is not necessary to suture the subcutaneous fat, but there is an æsthetic advantage in so doing. Such a suture prevents the skin adhering to the fascia and obviates the unsightly guttering of the scar which is observable in after-years in many patients whose wounds are not thus treated. Fine unfortified catgut should be used.

v. *Reconstituting the umbilicus*.—If the umbilicus has been treated by the method already described, it should now be reconstituted by passing a suture through one half of the reflected umbilical skin, then through the fascia and then through the other half. This suture when

tied remakes the pit of the umbilicus, and avoids the unsightly deformity which excising the umbilicus, or cutting round it, produces (Fig. 196).

vi. *Skin*.—The skin-incision may be closed either by suture or by means of Michel's clips.

If *suturing* is preferred, a simple continuous suture or a blanket suture of No. 2 silk on a straight 4-inch needle should be adopted,

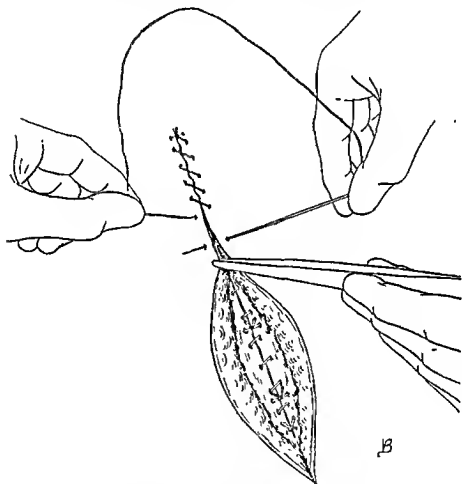


Fig. 197.—Suture of the skin.

care being taken to oppose the edges accurately, for otherwise healing may be less perfect (Fig. 197). When suturing the skin a vein may be pricked, and oozing rather more than should be neglected take place. As a rule, this oozing is at once stopped by tightening the suture, but if not, a pair of pressure forceps should be applied to the oozing spot for a few minutes, or a mattress-suture passed underneath it.

In septic cases, when suppuration of the wound is a possibility, simple interrupted sutures of silkworm gut are preferable to a continuous suture.

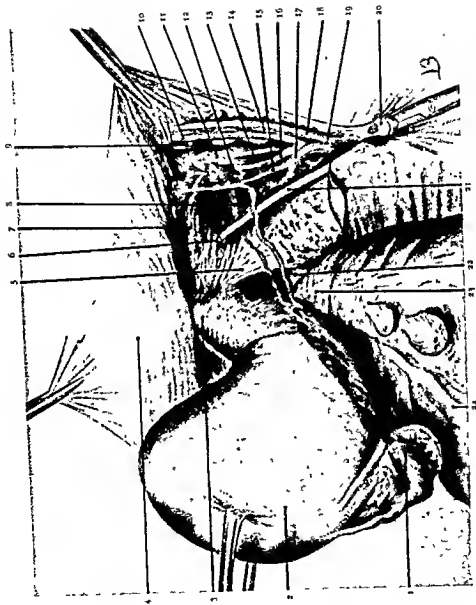


PLATE II.—Deep Dissection of the Female Pelvis, seen from above

1, Tube and ovary 2, Uterus 3, Vagina 4, Bladder 5, Canthal ligament 6, Oretic canal 7, Transuretric vessels.
 8, Uterine vein 9, Internal iliac vessels 10, External iliac vein 11, Obturator fat and glands 12, Hypogastric veins
 13, Obturator foras 14, Intra iliac glands 15, Hypogastric artery 16, Internal iliac vein 17, Internal iliac artery
 18, External iliac artery 19, Common iliac artery 20, Stump of o.ato pelvic ligament 21, Uterus 22, Lateral ligament
 of rectum 23, Rectum by low peritoneal reflexion. 24, End of pelvic colon

In some circumstances, as, for instance, extreme flabbiness of the abdominal wall, or when post-operative bronchitis is anticipated, when the patient is pregnant and labour is soon due, in exceedingly restless patients or in those who are insane, it is good practice to reinforce the four-tier suture described by a few through-and-through interrupted silkworm gut sutures (Fig. 198). Two of these are with

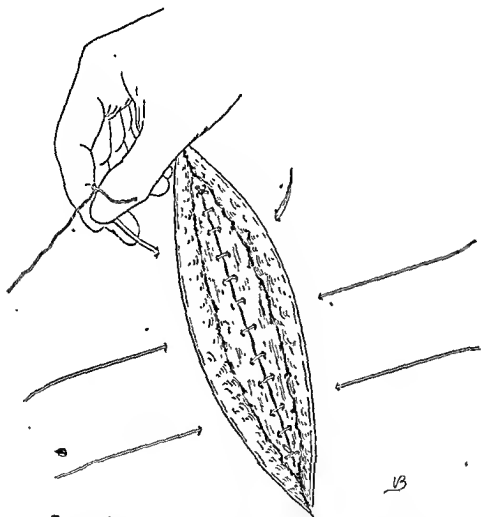


Fig. 198.—Inserting through-and-through sutures.

advantage inserted on either side of a drainage track, so as to close the planes of the abdominal wall and prevent suppuration from extending along them. A piece of thin rubber tubing, $\frac{1}{2}$ to $\frac{3}{4}$ inch long, should be threaded on to each suture to prevent its cutting into the skin when tied.

Through-and-through sutures should be inserted accurately, transverse to the incision, with the points of entrance and egress at equal distances from the wound edges. The best way to achieve this is to dip the

point of a Spencer Wells forceps in Violet-green and dot out the positions before passing the needle.

For most cases the best method of closing the skin, in our opinion, is by Michel's clips. Their advantages may be thus summarized:

1. It is to be remembered that every suture penetrating the skin is, in fact, a seton. Both during its insertion and its removal, particles of epidermis, possibly infected, tend to be implanted in the underlying connective tissue, while during the whole of its tenure a potential track for the downgrowth of organisms is created. We believe that many stitch-abscesses are thus caused. Michel's clips, since they do not penetrate the thickness of the skin, are free from this objection.

2. Owing to the broad surface of contact effected by the clips, a peculiarly strong union occurs, so that they may be safely removed 5 days after the operation. This is a great relief to the patient.

3. They can be inserted in less time than that taken by the quickest method of suture.

4. The subsequent scar is very narrow, and stitch-hole scars are not left. Moreover, the scar tends less to adhere to the fascia and become depressed. This may seem a small matter in a situation like the abdomen, but in our experience many women are very sensitive, and naturally so, of an unsightly scar disfiguring the natural curve of the abdominal wall.

Application of Michel's clips.—The pubic angle of the wound is seized with the insertion-forceps in the right hand, and the skin edges are approximated with the clip-holder in the left hand, about half an inch cephalward to it. The lower edges of the incision are then pulled taut by making traction with the clip-holder in a cephalward direction, and, with the forceps in the right hand, the surgeon removes a clip from the holder and unites the skin-edges close to the lower angle of the incision (Fig. 199). He now, without letting go of the clip he has inserted, makes pubicward traction on the forceps holding it, and thus renders taut the ununited skin-edge adjoining, which is again approximated with the clip-holder about half an inch from the clip that has been fixed. Traction is made with the clip-holder in the cephalward direction while another clip is removed and fixed, and so on. One of us (V.B.) has introduced clips double the breadth of the standard pattern with two spikes instead of one on each side; they hold on much more firmly.

Removal of sutures and clips.—Skin-sutures should be removed on the 7th day after the operation, except in the case of through-and-through sutures, which may be left *in situ* for 10 to 14 days if the surgeon thinks necessary. If Michel's clips have been used, they should be removed on the 5th day. The clips are easily and best removed by means of the special forceps figured on p. 17. The clip

having been steadied by forceps held in the left hand, the beak of the removal forceps is inserted under the clip, which is then opened out and removed. A narrow strip of gauze along the wound and two or three hands of adhesive strapping are then applied.

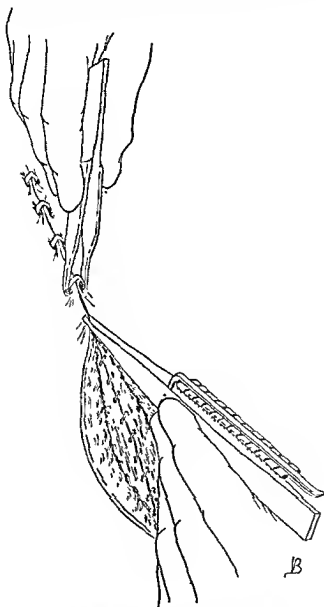


Fig. 199.—Inserting Michel's clips.

TRANSVERSE SUPRAPUBIC INCISIONS

In many abdominal operations for pelvic disease it is possible, and preferable, to make a *transverse incision* through the skin just above the symphysis pubis and through the pubic-hair field, instead of the usual vertical incision. The advantage is purely cosmetic; when the

hair grows again the scar becomes invisible, and, moreover, a transverse scar does not tend to widen out with time as does one that is vertical.

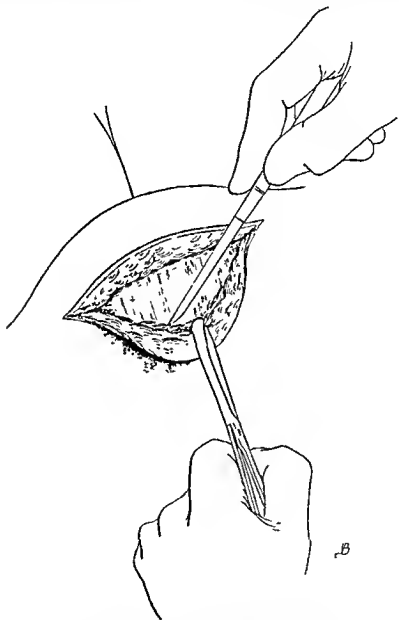


Fig. 200.—Transverse suprapubic incision.

The avoidance of a disfiguring scar, moreover, is no small gain, especially in the case of young women. Some people are rightly very sensitive of every deformity or blemish on their persons, and, in addition, they may have private reasons for avoiding a visible scar.

The drawback to a transverse incision is that it cramps the operator's

field of view and action and increases the difficulty of the operation, often to such an extent that its use is unjustifiable. Nevertheless, there are many cases in which it is far the more artistic procedure

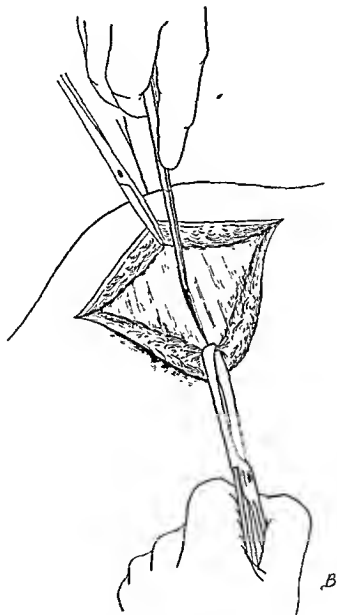


Fig. 201.—Incising the fascia vertically.

as, for instance, when shortening the round ligaments or removing small fibroids or small ovarian cysts, or when performing subtotal hysterectomy if the uterus is but little or not at all enlarged. To one skilled in abdomino-pelvic surgery, other and more difficult operations can be performed through such an incision, but the beginner will be

wise if he chooses his cases carefully and avoids employing it in well-covered or stout patients.

Two methods are available:

I. Transverse incision of the skin only.

i. Incision of the skin.—The skin is incised transversely and then, together with the underlying fat, is dissected upwards from the aponeurosis as a flap (Fig. 200).

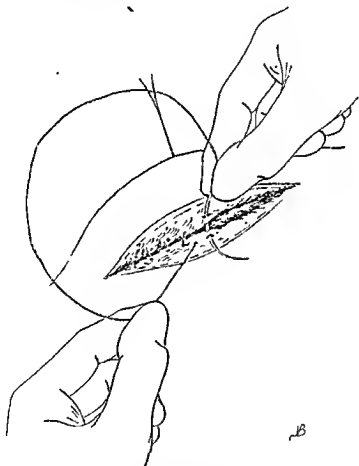


Fig. 202.—Suturing the fat.

ii. Division of the aponeurosis, muscles and peritoneum.—The aponeurosis, muscles and peritoneum are divided vertically, the assistant retracting the upper edge of the skin in the meantime (Fig. 201).

iii. Closure of the abdominal cavity.—See p. 274.

In addition, the subcutaneous fat is sutured with a continuous catgut suture, No. 00 (Fig. 202), or, better still, a series of interrupted sutures. This is an important step, for if it is not done, the scar tends

to gutter when the patient stands upright, and the pubic hair drawn in along this line makes a very ugly deformity.

iv. Dressing.—The surgeon must be exceedingly careful to see that every bleeding-point is controlled before he closes the skin incision, otherwise a very troublesome hæmatoma is apt to form under the flap. As an additional safeguard against the formation of a hæmatoma, a

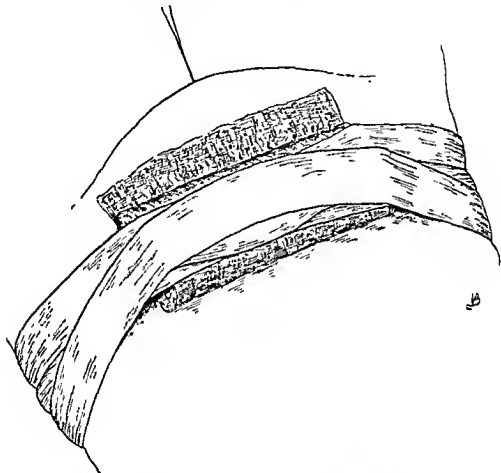


Fig. 203.—Application of the pad to compress the skin flap.

thick roll of gauze is placed over the flap and kept tightly pressed down by several bands of strapping (Fig. 203).

II. Transverse incision of the skin and aponeurosis.

i. The skin and fat are divided transversely, as before, down to the aponeurosis, and the operator slightly frees the cut edges from the aponeurosis throughout the length of the incision.

ii. Incision of the aponeurosis.—This incision is carried out in the same line as the skin-incision and for nearly an equal length. In the middle line it will be found that there is an attachment which must be divided between the aponeurosis and the plane of tissue dipping

down between the recti muscles. This having been divided, the edges of the cut aponeurosis retract up and down and expose the muscles underneath.

iii. Separation of muscles and division of peritoneum.—The muscles are separated vertically and the peritoneum is divided in the same direction.

iv. Closing the abdominal cavity.—See p. 286.

This method has the advantage of giving more room than the flap method, and, further, the liability to the formation of a hæmatoma is avoided. On the other hand, one cannot make the line of the incision so low down: if, therefore, the hair field is of small area the scar lies above it, and the cosmetic advantage over a vertical incision is largely lost. Moreover, if the wound suppurates, a weak scar is left that is very difficult to repair. Of the two methods we prefer the first, except in special circumstances (see page 576).

Difficulties and dangers.—See p. 283. Owing to the low position of the incision, the bladder stands in special danger of being inadvertently opened. The incision in the skin should be accurately transverse, for the sake of neatness, and to make certain of achieving this we use a stencil.

By some surgeons large transverse incisions with transverse division of the aponeurosis are very commonly employed but, since the scar necessarily lies above the hair area, the principal advantage over a vertical incision is lost and, though the access obtained is greatly widened so that extensive operations can be done through it, yet, if occasion demands that the operator shall invade the upper abdomen, a second incision becomes necessary. It is claimed that scar hernia is less likely with a transverse incision, but we do not agree with this. It is true, however, that on the average a transverse scar of the skin is less likely to broaden with time than a vertical one.



CHAPTER XIII

SUBTOTAL HYSTERECTOMY BY THE ROUTINE METHOD

Indications.—This is the usual method of performing subtotal hysterectomy. The technique is indicated in all conditions in which the body of the uterus is either movable or, being adherent, can be freed, and in which the broad ligaments and supravaginal cervix, beyond being elongated, are not deformed by the presence in them of a tumour.

This is not the correct method of performing subtotal hysterectomy for myomata of the supravaginal cervix or broad ligament, nor for those cases in which the top of the uterus is tethered down by adhesions which cannot readily be divided. For such cases the methods described on p. 328 and Chapter xv are properly to be employed.

I. SUBTOTAL HYSTERECTOMY WITH CONSERVATION OF THE APPENDAGES

Preparation of the patient.—See p. 78. For all cases in which hysterectomy is determined on, the vagina should be swabbed out with Violet-green in case that passage is opened; for, though the original intention may have been to perform the sub-total operation, total removal may be found necessary (see p. 30).

Instruments.—See p. 262.

Operation.—The following are the steps of the procedure :

i. **Opening the abdominal cavity.**—See p. 274.

ii. **Packing off the intestines.**—See p. 282. In the case of a large fibroid it may be necessary to deliver the tumour before packing off the intestines.

iii. **Delivering the uterus.**—If the uterus is the seat of a tumour, the surgeon slips his left hand into the abdominal cavity under it, and while he is lifting it through the wound his right hand assists in retracting the parietes on the right side, the assistant, if necessary, doing likewise on the left. If the uterus is not enlarged, it cannot, except in thin women with very lax tissues, be brought outside the abdominal wound. Delivery may be assisted by traction on a volsellum fixed to the uterus.

iv. **Clamping the ovarian vessels.**—Two pressure forceps are now applied to the upper border of the broad ligaments on each side. Their exact position will depend upon whether the ovaries are going to be conserved or not.

If the ovaries are reasonably healthy, they should always be conserved, and in this case the forceps will be applied between the uterus and the ovary. The inner pair of the two forceps clamps the tube, the

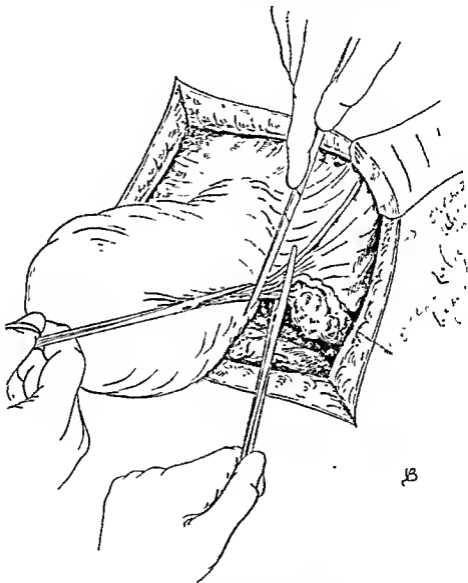


Fig. 204.—Subtotal hysterectomy: Clamping and dividing the ovarian vessels.

round ligament and the ovario-uterine ligaments, including the ovarian vessels close to the uterus. The outer forceps is applied an inch nearer the ovary in a similar manner, except that in certain cases it is impossible to include the round ligament in it. In this case the round ligament has to be clamped separately (Fig. 204). If, however, it has

been decided to remove the ovaries, then the outer pair of forceps is applied to the ovario-pelvic ligament outside the ovary.

v. *Clamping the round ligament.*—In some cases, in which the upper portion of the broad ligament is expanded by the growth of the tumour, it will be found that while one pair of forceps will suffice to secure the

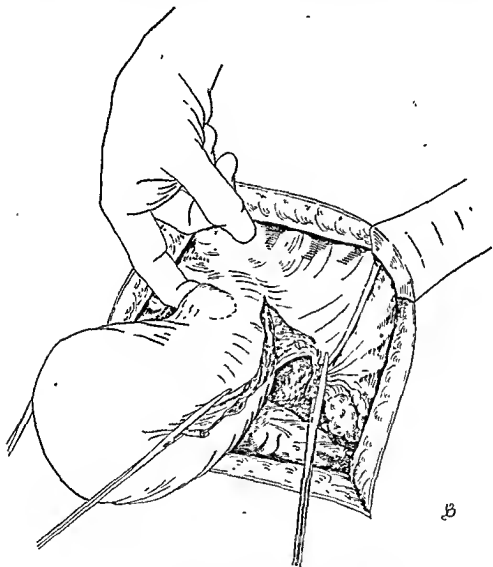


Fig. 205.—Reflecting the anterior peritoneal flap.

round ligament, Fallopian tube and ovario-uterine ligament as they come off the cornu of the uterus, farther out, owing to the spreading of the broad ligaments, separate clamping will be necessary.

vi. *Dividing the upper part of the broad ligament.*—The tissues between the two pairs of forceps (or three if the round ligament has been clamped separately) are now divided with the scalpel or scissors, in a

direction at first parallel to the side of the uterus. When, however, a point below the round ligament has been reached, the incision should be carried slightly outwards in a direction parallel to the round ligament.

vii. Opening up the broad ligaments.—The incision having been carried as far as the lower limit of the avascular space which lies beneath the ovario-uterine and round ligaments, the broad ligaments are then opened up towards the uterus by hooking the forefinger of each hand between the cut edges of the peritoneum and abducting them, while the uterus is pulled over to the opposite side by the assistant so as to bring the uterine vessels into view.

viii. Reflecting the anterior flap of peritoneum.—The anterior flap of peritoneum is, as a rule, quite easily dissected off the lower part of the uterus or tumour and turned downwards. Exactly how much peritoneum should be reflected is a matter of experience rather than rule, but sufficient must be taken to cover the stump later on. When in doubt, therefore, it is better for the operator to take too much than too little, for it can be trimmed easily, if necessary, and peritoneal flaps always shrink more or less. Before reflecting the anterior flap, its upper limit should be delineated by raising the loose peritoneum on the front surface of the lower segment of the uterus with the finger (Fig. 205). If nothing but peritoneum is raised there will be little or no oozing, but this will not be the case if the anterior flap be fashioned by *culling*, for in that case a certain amount of subserous muscle will be included in it. The separation of the peritoneum on the front of the lower uterine segment is effected easily, except along a frænum-like attachment in the middle line, which may require a touch with the scalpel.

The chief care in dissecting off this flap is to see that the bladder is not injured. If the operator is in any doubt as to the condition of this organ, he should have a sound passed into it, but to the experienced eye it is recognizable as a ridge running across the anterior surface of the peritoneum at the bottom of the utero-vesical pouch.

ix. Clamping the uterine vessels.—After the anterior flap has been separated and the broad ligaments have been opened up, the uterine vessels can often be seen running up the uterine wall, or, if not seen, can be felt pulsating, and at this stage pressure forceps are applied to them on each side (Fig. 206).

In many cases the uterine vessels can be clamped before reflecting the anterior flap, a procedure which has the advantage of minimizing any oozing during the reflection.

x. Dissecting down a posterior flap of peritoneum.—If the full extent of the movable peritoneum on the front of the uterus has been utilized in making the anterior flap, a posterior flap is not necessary. If, however, it is desired to make one, the assistant should drag the uterus forwards, and, the upper limit of the posterior flap having been indicated

with the scalpel, the peritoneum is reflected downwards. As this membrane is more adherent to the posterior than to the anterior surface of the uterus, greater difficulty will be found in its separation than in the case of the anterior flap, and care must be taken not to button-hole it. Very often it is impossible to limit the flap to peritoneum only, and

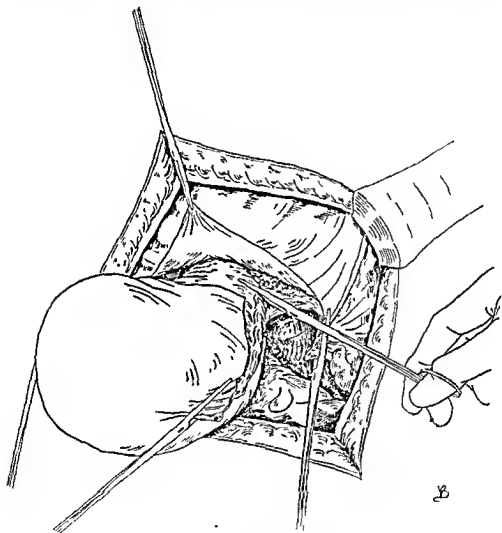


Fig. 206.—Clamping the uterine artery.

some of the subjacent tissue has to be dissected off with it, when oozing—which is, however, of little consequence—may be rather marked.

xi. Dividing the uterine vessels.—The uterine vessels, on each side, should now be divided at a point a full three-quarters of an inch above the forceps holding them. This is done so as to ensure that a good length of the vessels projects above the level of the cervical stump. Such projection renders the subsequent ligation of the vessels easier and safer.

xii. Amputating the body of the uterus.—The operator now pulls the

uterus over towards him with his left hand, and amputates it slightly above the point where the uterine vessels are clamped (Fig. 207). The stump of cervix that remains will, if the vessels have been properly occluded, appear white.

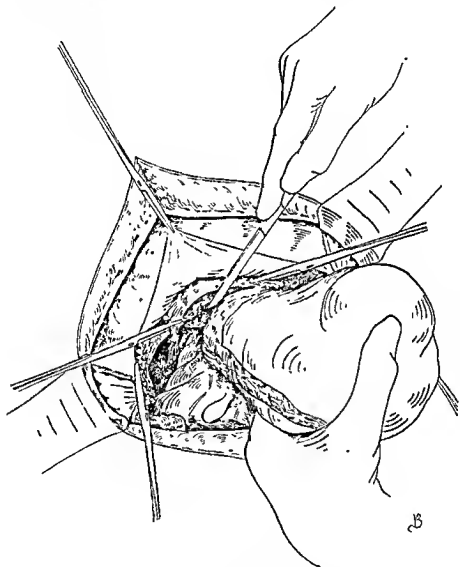


Fig. 207.—Amputating the uterus.

The amputation of the uterus may be carried out in different ways. As a rule a wedge-shaped incision should be made so as to form flaps of cervical tissue, which, when sutured together, obliterate the raw surface of the stump. A quicker method is to cut the cervix straight across, but this should be adopted only when speed is a matter of urgency. Other surgeons aim at removing as much as possible of the cervical

stump, short of performing total hysterectomy, in order to extirpate any diseased mucous membrane and reduce the bulk of the stump to a minimum. This they effect by a circular movement of the scalpel while strong traction is made on the portion being excised. If this manœuvre is carried to its extreme, nothing is left after the excision but a thin shell of cervical tissue (*see* p. 331).

Directly the uterus is amputated the stump should be drawn up for

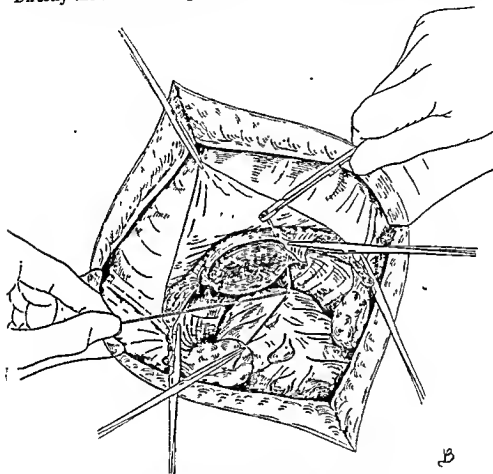
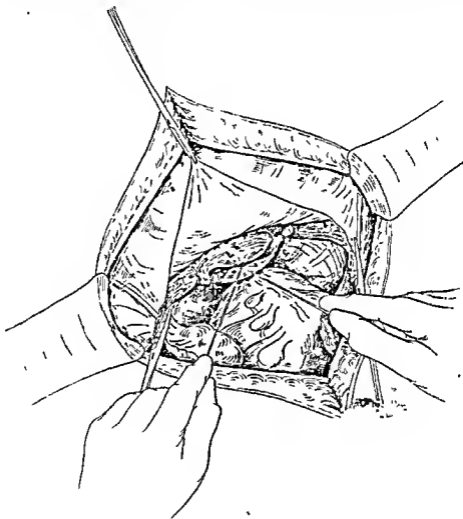


Fig. 208.—Tying the uterine artery.

inspection, either by seizing it with a volsellum or by pulling with a pair of forceps on the anterior flap. Any blood-clots having been cleared away, and all unsecured vessels clamped, the ligation of the uterine vessels is proceeded with.

xiii. Ligaturing the uterine vessels.—The cervical tissue on each side is transfixed and a No. 4 silk ligature is pulled through it in front of the points of the forceps which are clamping the uterine vessels (Fig. 208). The ligature is then tied below the forceps so as to encircle the vessels, the assistant meanwhile holding the forceps horizontally to prevent their points from catching in the grip of the ligature (Fig. 208). If,

when the forceps are removed, there is oozing from the uterine vessels, these must be re-clamped and another ligature applied. If in spite of such ligatures the stump is not quite dry, the oozing is due to the anastomosis between the vessels of the cervix and the vaginal arteries. This oozing can be stopped by one or two mattress-sutures passed



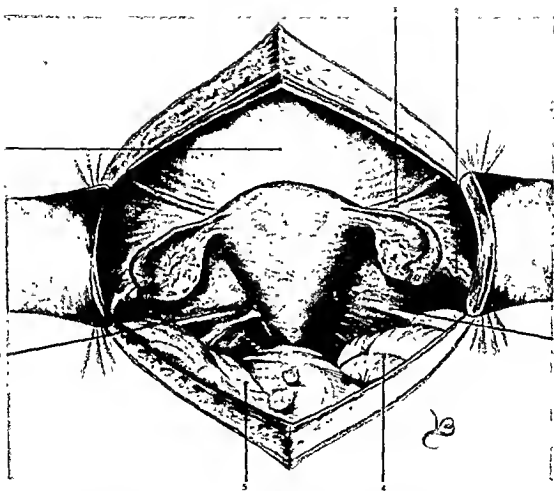


PLATE III.—The Female Pelvic Organs, seen from above

- 1, Round ligament 2, Ovario-pelvic ligament and ovarian vessels 3, Ureter 4, Small intestine
 5, Pelvic colon 6, Uterine vessels 7, Bladder.

1. A ligature of No. 4 silk is passed through that portion of the broad ligament which is deep to the forceps clamping the ovarian vessels and round ligament. The ligature is then brought outside the forceps over the upper border of the ovario-uterine ligament and tied so that the ovarian vessels are secured (Fig. 210). The two ends of the ligature

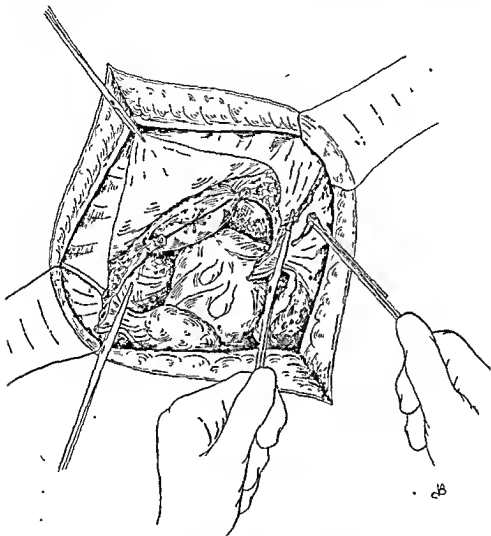


Fig. 210.—Securing the ovarian vessels.

are now carried round under the forceps clamping the round ligament and tied again (Fig. 211). This method should be followed when the round ligaments and ovarian pedicle are lax and elongated.

2. In the second method, the needle, into which is placed a long piece of No. 4 silk doubled so that the ends are equal, is drawn through that portion of the broad ligament which is external to the forceps clamping the vessels, between the vessels and the round ligament. The ligature is now divided and one half of it is then used to surround the ovarian

remainder of the peritoneum forming the posterior layer of the broad ligaments and covering the back of the cervical stump, until the corresponding point for a second purse-string is reached on the other side, when the ligature is made to describe a course identical with that previously indicated (Fig. 213). The purse-string thus formed, when pulled upon, inverts the stump into the broad ligament. The suture

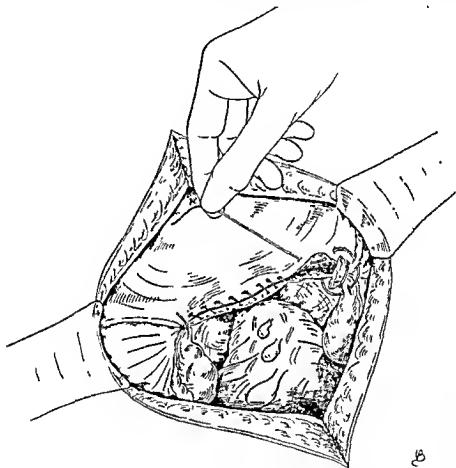


Fig. 213.—Burying the right ovarian pedicle.

is then finished off after again transfixing the broad ligament, just inside the point where the stump is buried.

2. *By transverse suture without burying the stumps.*—This is a quicker, though less perfect method, but may be employed when it is necessary to save time. A long piece of No. 1 catgut is made to pass through both layers of the broad ligaments, just internal to the ovarian and round ligament stumps, and is then carried across the pelvis to a corresponding point on the other side. Neither of the ovarian stumps is, therefore, buried, and there is a greater chance of adhesions forming. Such

adhesions are more dangerous on the right side than on the left, because on the left side the adhesion will be between the stump and the colon, which does not, as a rule, matter, while on the right side coils of small intestine may adhere, which is much more serious.

xvii. Closing the abdominal cavity.—See p. 286.

Difficulties.—The difficulties of this operation vary markedly in different cases. The difficulty is least when the patient has had children, the pelvis is shallow, the abdominal wall thin, the enlargement considerable and limited to the upper part of the body of the uterus, and the broad ligaments and cervix are elongated and thin. When the opposite obtains, the difficulties may be considerable, and especially so when the tumour has invaded the lower segment of the uterus and produced much thickening of the cervix. The gravest difficulties are, however, incurred by the operator mistakenly employing the technique just described in cases of cervical or broad-ligament myomata. Stress, however, may be laid on the following points :

i. **Small incision.**—If the primary incision is not of sufficient length, it can easily be enlarged in an upward direction, first placing a swab over the bowels and treating the navel by incising through it. If the peritoneal opening cannot be further lengthened towards the symphysis pubis on account of the bladder, it will often be found that the division of the fascia right down to the bone is of great advantage in aiding the delivery of the tumour.

ii. **Nature of the tumour.**—When the uterus is enlarged by tumours, usually myomata, growing in the supravaginal cervix or bulging into the broad ligaments, it cannot be delivered through the abdominal wound, because the stretched peritoneum over the lower uterine segment and broad ligaments fixes the organ.

These tumours require special treatment (see Chapter xv).

iii. **Impaction.**—The tumour, or part of it, may be impacted in Douglas's pouch and held there by atmospheric pressure. This difficulty may be surmounted by so tilting the tumour that a little air can rush in under it, or by seizing it with the volsellum, or by a combination of the two methods.

iv. **Adhesions.**—The tumour may be held fast by adhesions, so that it cannot be delivered until they are separated. If so, the adhesions must be separated with great care by means of the fingers, dissecting forceps, scissors, scalpel, or swab. If the freed ends of the adhesions bleed, they should be carefully ligatured with catgut. Special care must be taken in separating intestinal adhesions, because a wound of the intestine may result in a faecal fistula, or in peritonitis and death. It will be found that intestinal adhesions are often best separated by a stroking movement of the swab on the tumour portion of the adhesions ; but if they are so tough that they will not separate without cutting, and

the intestine is so close that there is a danger of wounding, it will be safer rather to cut off the superficial layer of the uterine wall to which the adhesions are attached, and leave it tethered to the intestine, or deliberately to resect the involved portion of the gut. If the intestine is wounded, it must be repaired according to the manner described elsewhere (p. 782). In the case of a firmly adherent portion of omentum

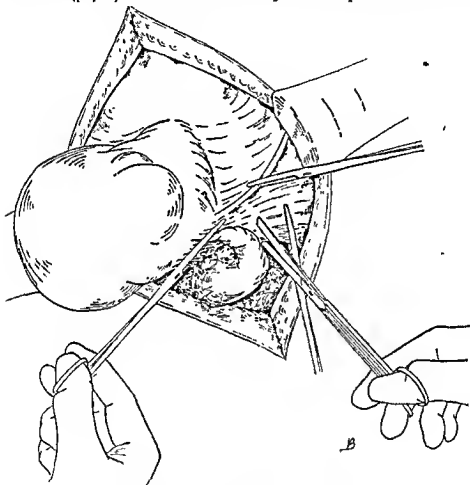


Fig. 214.—Hysterectomy and salpingo-oophorectomy: Clamping the ovarian vessels.

it is best to ligature and divide it, afterwards carefully examining the cut end to make sure that it is not oozing.

Adherent ovaries.—The ovaries, or an ovary, may be found so adherent and close to the uterus that there is no room to apply forceps between them, or it, and the uterus. In such circumstances there is no need to remove them (or it) with the uterus as is often done. Instead, a ring forceps should be applied to the ovario-pelvic ligament so as to control the ovarian vessels, and the ovary should be cut away from

the uterus, the proximal ends of the ovarian vessels being picked up with forceps and subsequently ligatured inside the ovary.

Dressing.—See p. 24. The vagina is carefully cleansed with swabs on long forceps, by which means any blood-clot that may have escaped through the cervical canal can be removed, or, if any serious bleeding is

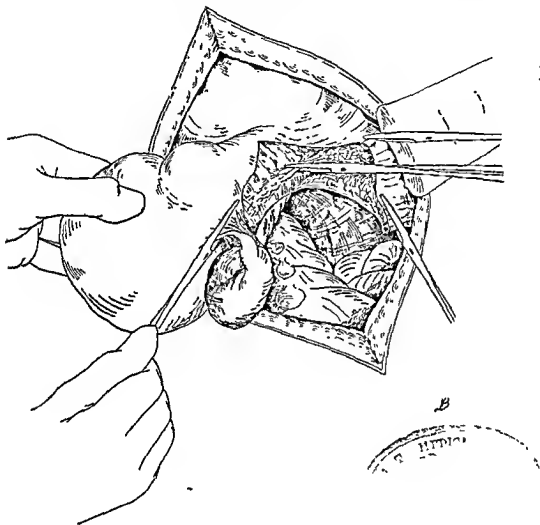


Fig. 215.—Clamping the uterine artery.

taking place from the cervix, as rarely happens, it may be detected and dealt with at once.

The urine passed during the next 12 hours should be measured and inspected. A proper amount of urine will be an indication that the ureters are intact, and the absence of blood will show that the urinary tract has not been injured.

After-treatment.—See Chapter xxx.

II. HYSTERECTOMY WITH SALPINGO-OÖPHORECTOMY

In the description already given of subtotal hysterectomy, it has been taken for granted that the ovaries and tubes were healthy, and they have accordingly been conserved.

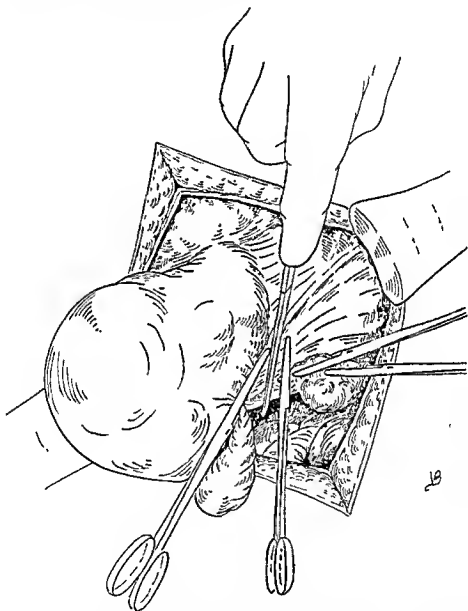


Fig. 216.—Hysterectomy with salpingectomy: The tube freed and clamps applied to the ovarian vessels.

It not infrequently happens, however, that one or both appendages are diseased. In such circumstances, the appendages may have to be removed with the uterus.

i. Clamping and dividing the ovario-pelvic ligaments and the round ligaments.—The diseased appendage is pulled up and separated from any adjacent structures to which it is adherent. The method of doing this and the difficulties encountered are described elsewhere (*see pp. 614-630*). The appendage having been freed, the ovario-pelvic ligament is clamped with pressure forceps well external to the Fallopian tube and ovary. A further pair of forceps having been applied an inch nearer the uterus, the upper part of the broad ligament is divided between the two (*Fig. 214*). The round ligament, separately clamped, is then divided.

ii. Clamping the uterine arteries.—The broad ligament being thus opened up and the appendage freed, the uterine artery is exposed and clamped (*Fig. 215*), and the operator then proceeds on the lines indicated at p. 304.

III. HYSTERECTOMY WITH SALPINGECTOMY

If the uterus has to be removed, there is no point in saving the tubes except in so far as it facilitates the operation. On the other hand it is possible that tubes left behind might become a source of future trouble, though this is extremely rare except when the conserved tube was unhealthy at the time of the operation. The removal of the tubes with the uterus is obviously indicated if they are diseased, and some surgeons make a practice of removing them every time they perform bysterectomy.

Separation of the tubes.—The tubes are pulled up, as soon as the uterus has been fully exposed, and the operation is begun by placing Spencer Wells forceps on the mesosalpinx of each side. The tubes are then freed with scissors up to their junction with the uterus, after which forceps are applied to the broad ligaments, in the way already described, and the removal of the uterus completed (*Fig. 216*).

CHAPTER XIV

ABDOMINAL TOTAL HYSTERECTOMY

I. BY THE ROUTINE METHOD

THIS operation may be indicated when the uterus is the seat of myomata, of malignant disease, fibrosis, chronic subinvolution and other innocent conditions giving rise to severe bleeding and, further, under occasional conditions of sepsis, of injury, or of congenital deformity, and in certain cases of inflammatory disease of the uterine appendages.

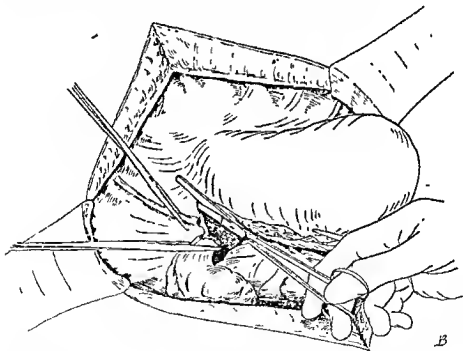


Fig. 217.—Routine total hysterectomy: Dividing the top of the broad ligament.

Preparation of the patient.—See p. 78.

Instruments.—See general list, p. 274.

Operation. i.—Before placing the patient in the Trendelenburg position the vagina should be swabbed out with Violet-green, flavine, or iodine solution, so as to sterilize it as far as possible. The first of these is to be preferred if available, not only because it is a better antiseptic,

because the deep coloration of the vagina makes the recognition of mits much plainer after the amputation has been carried out. In all s in which the uterus is infected or in which malignant disease is

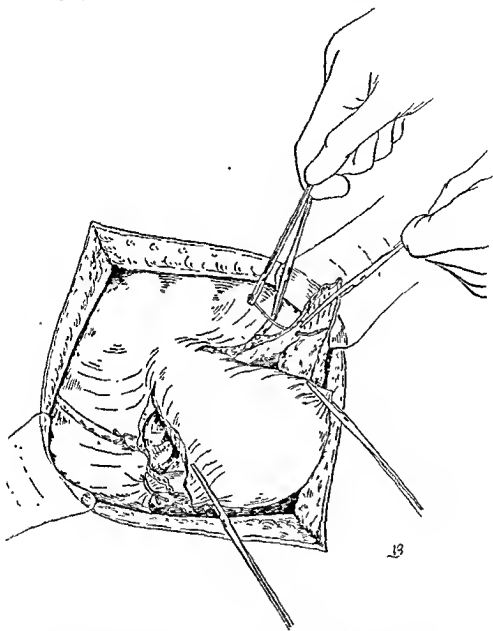


Fig. 218.—Ligature of the ovarian vessels and round ligament.

present in its cavity, the external os should be closed by a mattress-suture so as to prevent the uterine contents escaping into the peritoneum when the vagina is opened.

Aid against contamination, either by organisms or cancer cells, is obtained by packing the vagina with gauze soaked in Violet-green,

diluted with an equal quantity of water, leaving a long end hanging out of the canal. Just before the amputation an assistant should withdraw the gauze, which carries with it any infective material that may have escaped from the uterus.

ii. Opening the abdominal cavity.—See p. 274.

iii. Packing off the intestines.—See p. 282.

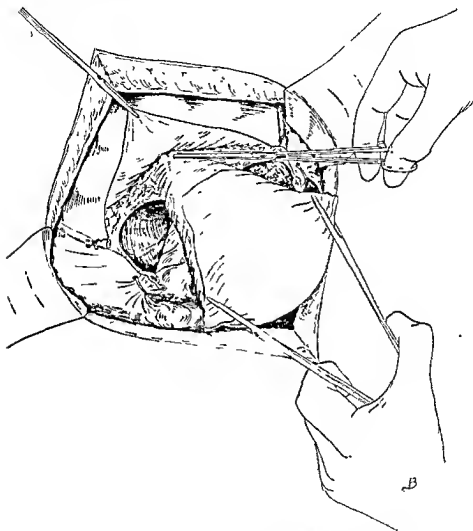


Fig. 219.—Reflecting the anterior peritoneum and bladder.

iv. Clamping the ovarian vessels and round ligaments.—The ovarian vessels and round ligaments are clamped with pressure forceps on each side, as described at p. 301. When the condition is benign, and the appendages are to be conserved, the forceps are applied inside the ovaries; but in malignant disease, when the appendages must be

removed, a forceps is applied to the ovario-pelvic ligament on each side, the round ligaments being clamped separately.

v. Dividing the top of the broad and round ligaments (Fig. 217).—See p. 303.

vi. Ligature of the ovarian and round ligament pedicles.—When

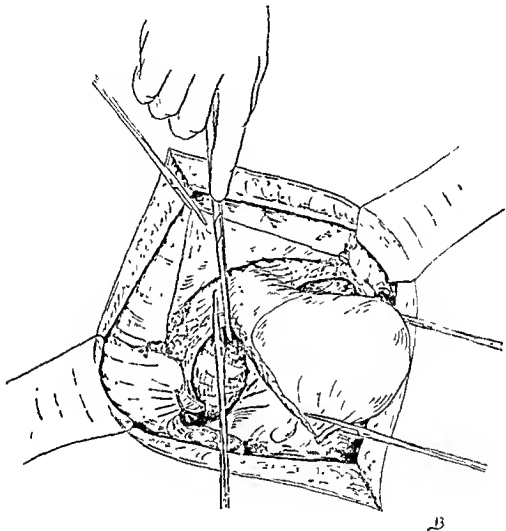


Fig. 220.—Clamping and dividing the uterine artery.

performing total hysterectomy it is advisable to ligature the ovarian vessels and round ligaments before proceeding further with the operation. This is done to get rid of the forceps clamping them, because it often happens that, after the removal of the uterus, there is free bleeding from the cut edges of the vagina and the cervical branches of the uterine artery, and to control this several forceps may be necessary. If the forceps holding the ovarian and round ligament stumps have not been previously removed, the operator's field of vision is obstructed by so

many of these instruments being on together (Fig. 218). The ligature is carried out in the manner described on p. 308.

vii. Reflecting the bladder.—An incision is made through the peritoneum on the front of the uterus, joining the incision in either

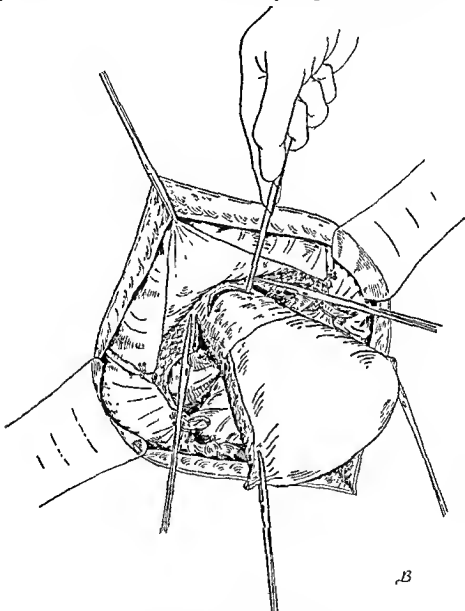


Fig. 221.—Incising the vagina.

broad ligament, in the manner described at p. 304, and the anterior peritoneal flap and subsequently the bladder are then carefully pressed back by pressure applied with a swab or finger, aided by cautious snips of the scissors, until the vaginal wall is reached. This is identified by

feeling the limit of the vaginal cervix and recognizing the parallel muscle-fibres on the front of the vagina (Fig. 219).

viii. *Clamping and dividing the uterine vessels.*—A pressure forceps

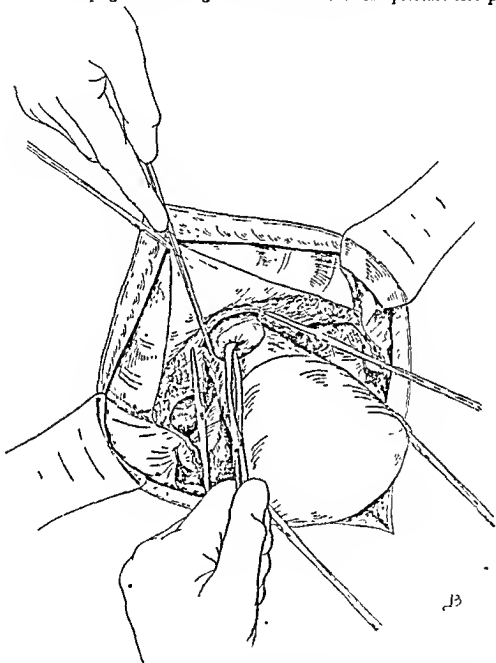


Fig. 222.—Pulling the cervix through the opening in the vagina.

is now applied to the uterine vessels on either side at the point where they reach the uterus. The forceps should be applied so that their blades are very nearly parallel with the lateral edges of the supravaginal cervix, but with a slight inclination of the points of the blades inwards.

Unless this is done, only the upward-turning branches of the uterine arteries will be controlled, and the cervical branches will be missed.

The forceps having been applied as directed, the tissue between them and the uterine wall is divided for the length of the forceps blades (Fig. 220).

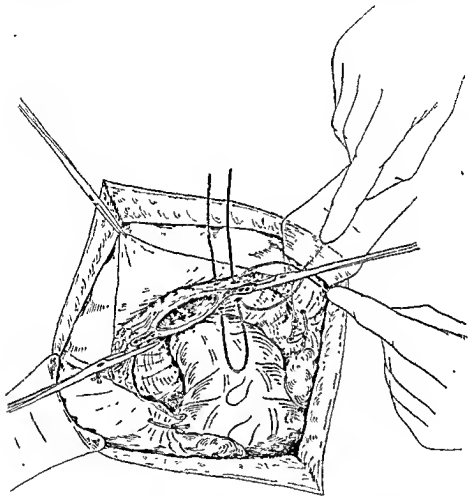


Fig. 223.—Ligature of the uterine artery and vaginal vessels.

ix. Opening the anterior vaginal vault.—The operator, having first directed the nurse to withdraw any gauze from the vagina, now makes a U-shaped incision with the concavity upwards through the anterior vaginal wall just below its junction with the supravaginal cervix (Fig. 221).

x. Seizing the vaginal cervix.—The vaginal cervix is now pulled through the opening in the anterior vaginal wall with a volsellum (Fig. 222).

xi. Removing the uterus.—By means of the scalpel and scissors the

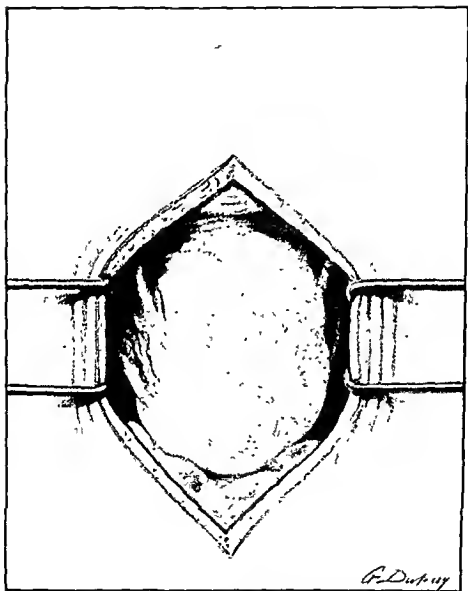


PLATE IV — Multiple Myomata of the Uterine Body.

incision in the anterior vaginal vault is now extended round the vaginal cervix at its junction with the vaginal vault to the level of the cut uterine arteries. The remaining tissues at the side and back of the cervix being similarly severed, the uterus is removed.

xii. Ligature of the uterine and lateral vaginal vessels.—The uterine arteries are secured by a ligature passed through the tissues just internal

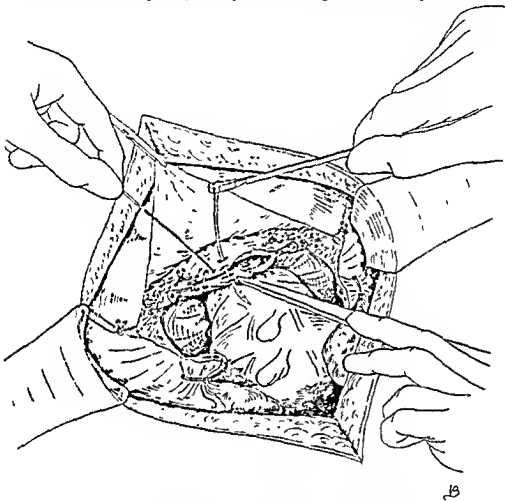


Fig. 224.—Closing the vagina.

to the artery, and ligatured. The lateral vaginal vessels are secured by a mattress-suture passed through the lateral angles of the vagina, internal to the uterine artery, and then tied (Fig. 223). Twenty-day catgut is preferable to silk because of the close proximity of the vagina.

xiii. Suture of the vagina.—The lateral angles of the open vagina are seized with forceps, and a continuous Lembert suture of No. 1 20-day catgut is inserted so as entirely to close the upper end of the canal (Fig. 224). When, however, the case is one complicated by serious septic infection, the vagina had better be left open, as it should be if the bladder or ureter has been injured and repaired.

xiv. Closing the peritoneum over the stumps.—Either of the two methods described on p. 311 may be used to close the peritoneum over the area of excision.

xv. Closing the abdominal cavity.—See p. 286.

Difficulties and dangers.—If the uterus is merely enlarged but not deformed the operation presents little more difficulty than subtotal hysterectomy, but it is otherwise if the patient is stout with a small uterus and deep pelvis. Here, from the depth at which the operator is working, the embarrassment of flatus-laden intestine and the presence of much adipose tissue, the resources of the operator may be greatly taxed. There are few more difficult operations than a total hysterectomy in a very fat, elderly woman with an old atrophic uterus. The principal danger is injury to the ureter or ureters which lie in close proximity to the cervix. If the forceps controlling the uterine vessels are applied close to the uterus in the manner described and all cutting of tissue is confined to the inner sides of them, the ureter cannot very well be injured. The bladder may be opened in separating it from the vagina, but this should not happen if the operator clearly defines the plane of cleavage.

During the final severance of the uterus the rectum may be cut if, as sometimes happens, it is abnormally adherent to the front wall of Douglas's pouch. In its normal relation it is unlikely to be injured, but as a safeguard the operator can place a swab in Douglas's pouch before dividing the posterior vaginal wall.

Hæmorrhage from the lateral vaginal angles and posterior vaginal wall may be free, and such bleeding is very baulking when the patient is fat and the pelvis deep. It is in such cases that there is a risk of including one of the ureters in a ligature, the operator picking up a large mass of the lateral tissues and ligaturing it without realizing that the ureter is contained within it.

Dressing and after-treatment.—See p. 24 and Chapter xxx. A certain number of cases present some foul vaginal discharge during the second week, due to infection of the suture closing the vagina. Vaginal douches should be given if this happens.

II. BY OPENING THE POSTERIOR VAGINAL VAULT FIRST

An alternative method is to open the posterior vaginal vault first.

The steps of the operation are the same as the foregoing up to the reflection of the bladder. The surgeon then proceeds as follows:

viii. Cutting through the posterior vaginal wall.—The uterus is dragged well forwards with a volsellum, and a transverse incision is made with scissors through the posterior vaginal wall, which is rendered accessible by tightly packing the vagina beforehand (Fig. 225).

ix. Cutting through the anterior vaginal wall.—The first and second

fingers of the left hand are pushed through the posterior opening into the vagina, and the anterior vaginal wall is stretched over them; then with his scalpel in his right hand the surgeon cuts through the anterior vaginal wall on to his fingers, which are slipped through the opening as it is enlarged (Fig. 226).

x. Clamping the uterine vessels and removing the uterus.—The

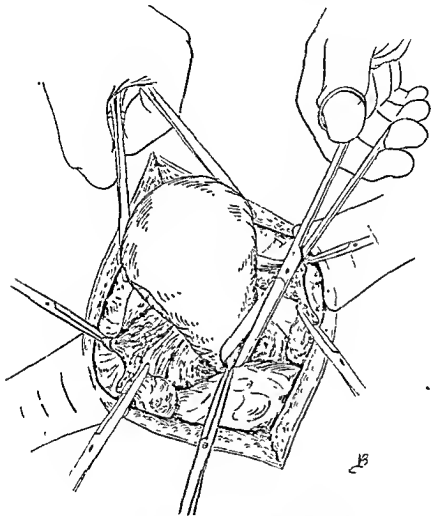


Fig. 225.—Total hysterectomy by opening the vagina behind: Cutting through the posterior vaginal wall.

uterus is now held only by a couple of lateral folds, each of them consisting of a leash of uterine vessels, some cellular tissue surrounding them, that part of the cardinal ligament attached to the cervix, the wall of the lateral vaginal fornix, and the posterior peritoneum.

The uterus being well pulled up, a pair of long pressure forceps is applied on each side of these folds, which are then divided, keeping the knife or scissors as close to the uterus as possible (Fig. 227).

III. BY BONNEY'S METHOD

This method is suitable for dealing with a myoma of the posterior wall of the supravaginal cervix which has burrowed underneath the peritoneal lining of Douglas's pouch and has stripped the peritoneum off the rectum and invaded the mesocolon. It would also serve in a

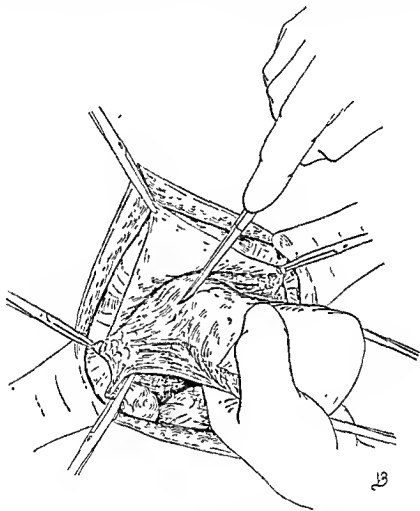


Fig. 226.—Opening the vagina in front.

case in which the intestine was so adherent to the fundus of the uterus that it could not be separated from above, or in which a malignant growth of the bowel was fused to the top of the uterus and it was possible to remove the segment of the intestine and the uterus *en masse*.

Operation. i. Opening the abdominal cavity.—See p. 274.

ii. Clamping the round ligaments.—The round ligaments on each side are clamped with pressure forceps and divided close to their uterine attachment.

iii. Stripping back the bladder.—An incision is made through the peritoneum from round ligament to round ligament, and the peritoneum and subsequently the bladder is stripped off the cervix and upper inch of the vagina.

iv. Delivering the cervix through an incision in the anterior vaginal wall.—The anterior vaginal wall is incised transversely, and through the

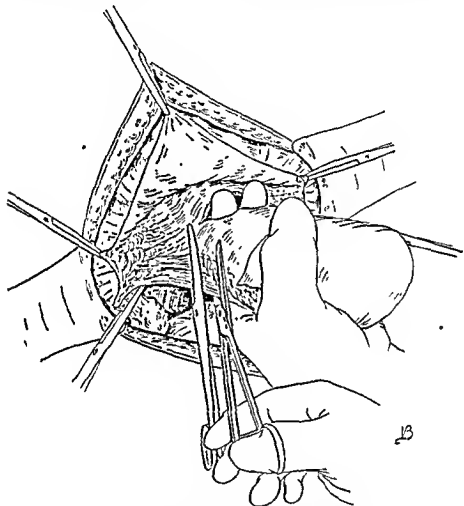


Fig. 227.—Clamping the uterine vessels.

hole thus made the cervix is pulled by a volsellum. The vaginal wall is then circumcised at its junction with the cervix.

v. Clamping and dividing the uterine arteries.—The cervix being pulled well up, the paracervical tissue is clamped and divided close to the cervix, the uterine artery on each side being thus secured (Fig. 228).

vi. Separating the tumour from the rectum.—The surgeon is now able to pull the lower pole of the uterus upwards to a much greater extent and the tumour is gradually separated from the rectum.

vii. Clamping and dividing the ovarian vessels.—As the uterus is

pulled up, the upper parts of the broad ligaments come into view and are clamped and divided.

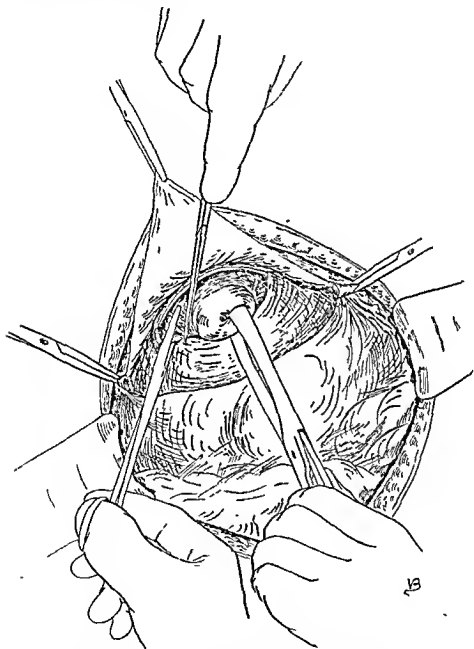


Fig. 228.—Total hysterectomy by Bonney's method: Securing the uterine vessels.

viii. Separating the fundus of the uterus.—Finally the adhesions fixing the fundus of the uterus are divided except in those cases in which

the object is to remove the uterus *en bloc* with the intestine adherent to it.

ix. *Ligaturing the vessels and suturing the peritoneum.*—See pp. 307-313. As a very large area of denudation is necessarily left, as much peritoneum from the anterior surface of the uterus as possible should be saved.

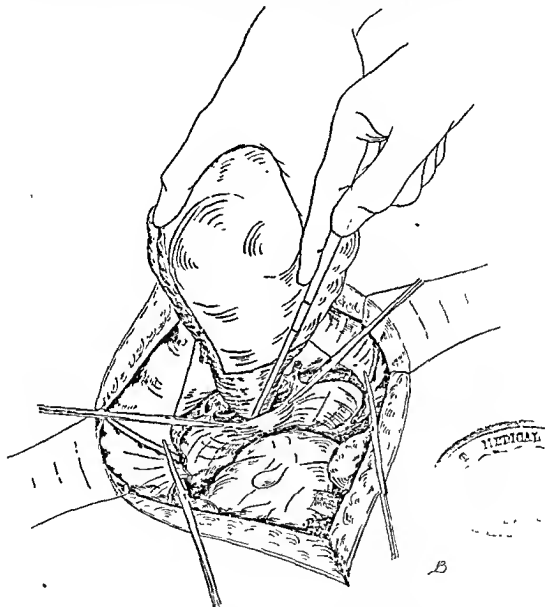


Fig. 229.—Total hysterectomy by reaming out the cervix.

IV. BY REAMING OUT THE CERVIX

An alternative method of performing total hysterectomy is by reaming out the cervix. This is not a true total hysterectomy, since a thin shell of cervical muscle is left behind, but the entire mucosa of

the cervix is removed down to the external os. It is an excellent method of performing total hysterectomy for non-malignant conditions, being not only an easier operation than the routine method just

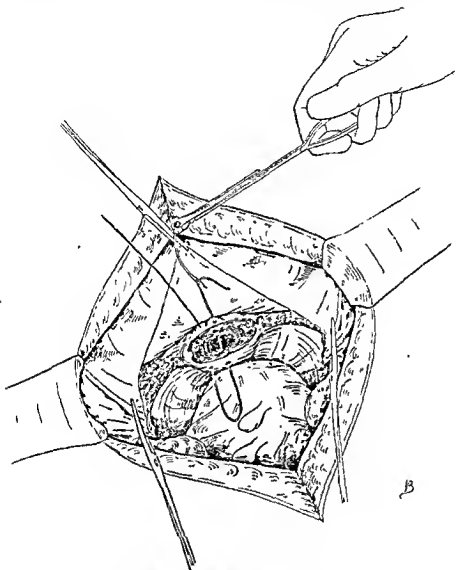


Fig. 230.—Closing the hollow stump.

described, but having the further advantage of not deforming or weakening the vaginal vault.*

The steps of the operation are similar to those described for subtotal hysterectomy on pp. 301-304, up to the point where the uterine

* The operation was performed by Bland-Sutton as far back as 1899, but its principal advocate and exponent was Ralph Worrall of Sydney. Schlink, of the same city, devised an ingenious instrument for reaming out the cervix.

arteries are clamped and divided, after which the operation proceeds as follows :

Reaming out the cervix.—Instead of amputating the cervix by a wedge-incision, the scalpel is made to cut circularly round the cervix inside the uterine arteries in a direction nearly parallel to the axis of the cervical canal, the point of the scalpel being kept downwards in the manner shown in Fig. 229. While the scalpel is being carried round and round, strong traction upwards is made on the uterus, with the result that the bulk of the cervical tissue is reamed out. When the reaming out has almost reached the vaginal surface of the cervix, it will be noticed that the vaginal surface of the cervix everts towards the abdominal cavity. When this stage is reached, the remaining tissues should be cut straight across and it will be found that the vagina has been opened into.

Ligaturing the uterine arteries.—These are ligatured in the same manner as in subtotal hysterectomy. Separate ligatures to secure the lateral vaginal vessels are not required.

Closing the stump.—A deep excavation remains, bounded by a thin shell of cervical musculature. This should be obliterated by a series of mattress-sutures passed in the manner shown in Fig. 230. It is most important completely to obliterate this excavation, and usually two layers of sutures will be necessary, one above the other. If any part of the excavation is missed in this closure, profuse hæmorrhage into the vagina after the patient has been returned to bed is very likely. The subsequent steps of the operation are similar to those described under subtotal hysterectomy on p. 308.

Difficulties and dangers.—These are the same as those of subtotal hysterectomy. The possibility of hæmorrhage from the excavated cervix has already been mentioned. Generally it can be controlled by putting the patient in the lithotomy position and passing one blade of a ring forceps up the excavated cervix, with the other blade in the vaginal fornix.—When the forceps is locked, the cervical tissue is compressed between the blades. The forceps is left on for 48 hours. If this fails, the abdomen must be re-opened.

As the line of amputation does not extend beyond the confines of cervical tissue, the risks of injuring the ureter, bladder, or rectum, which obtain in true total hysterectomy, are practically absent.

CHAPTER XV

HYSTERECTOMY FOR CERVICAL AND BROAD-LIGAMENT MYOMA

General remarks.—A myoma growing from the supravaginal cervix is not suitably treated by the classical methods of performing subtotal and total hysterectomy, the former because the amputation would have to take place across the tumour, leaving one-half of it behind, and the latter because in a large cervical myoma the tumour is so impacted in the pelvis and so overhangs the vagina that the wall of this canal cannot be reached until the tumour is much displaced or actually cut away. In order to understand the technique of the removal of these tumours an appreciation of their anatomical relations is necessary. Cervical myomata may be classified as—

(1) *Anterior*, when a tumour springing from the superficial muscle bulges forwards and undermines the bladder.

(2) *Posterior*, when a tumour similarly situated on the posterior surface of the cervix either flattens the pouch of Douglas from before backwards and compresses the rectum against the sacrum, or the rarer form in which the tumour undermines the peritoneum at the bottom of Douglas's pouch, and, obliterating this cul-de-sac, lifts the serous membrane off the anterior surface of the rectum and sacrum, and pushes down between the vagina and rectum.

(3) *Lateral*, when the myoma, starting on the side of the cervix, burrows out into the broad ligament and expands it. These tumours in their growth outwards may fill the whole broad ligament and sometimes find their way between the layers of the mesocolon, the bowel lying sessile upon them. Their relation to the ureter is important. Most commonly this structure is underneath the growth and to the outer side. Very rarely, when the myoma starts low down at the junction with the vagina, it may insinuate itself under the ureter and lift it on its upper surface high up out of the pelvis.

(4) *Central*, when the tumour, either of interstitial or of submucous origin, expands the cervix equally in all directions. This variety of tumour may present all the anatomical vagaries mentioned in connexion with the other three varieties.

A central cervical myoma can at once be recognized on opening the abdominal cavity by noticing that the cavity of the pelvis is more or less filled by a tumour, elevated on which is the body of the uterus,

like "the lantern on the dome of St. Paul's"—to use Bland-Sutton's very apposite simile. This characteristic appearance does not occur when there is a second tumour in the body of the uterus itself; and there is a variety of fundal submucous myoma which, being extruded down the cavity of the uterus, expands the supravaginal cervix without having any attachment to it. This variety may be termed the *pseudo-cervical* myoma.

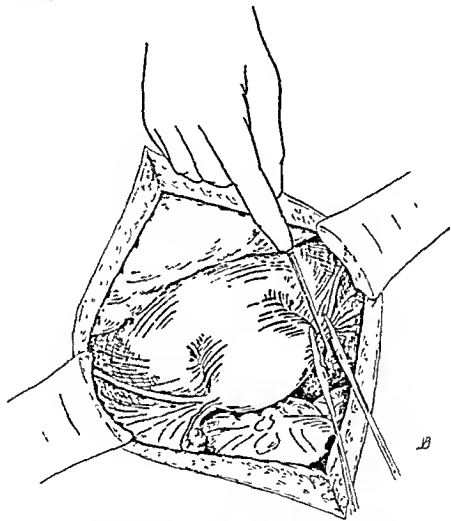


Fig. 231.—Hysterectomy for a central cervical myoma:
Dividing the ovario-uterine and round ligaments.

(5) Lastly, cervical tumours may be *multiple*, so that a lateral myoma may be present on both sides, or an anterior myoma may be coexistent with a posterior tumour, or a lateral myoma may complicate either an anterior or a posterior one.

The operation for the removal of a cervical myoma is usually difficult, and may at times be an extremely formidable undertaking. The natural difficulties of the operation are, however, greatly enhanced by

a want of knowledge of the technique most suitable to the occasion, and ignorance on the operator's part of the altered anatomical relations of the surrounding structures. It is for this reason that we have laid such stress upon the disturbance of the normal relations to one another of the various structures involved.

I. HYSTERECTOMY FOR A CENTRAL CERVICAL MYOMA BY TRANSVERSE INCISION, WITH PARTIAL ENUCLEATION OF THE BASE

Preparation of the patient.—See p. 78.

Instruments.—See general list, p. 274.

Operation.—The steps of the operation are as follows :

i. Opening the abdominal cavity.—As cervical myomata usually raise

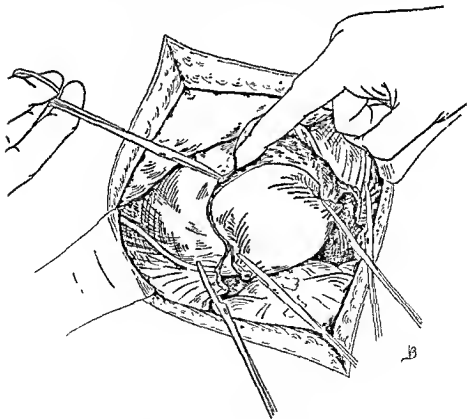


Fig. 232.—Reflecting the anterior peritoneal flap.

the bladder much above its normal level, special care must be taken not to injure it. See p. 284.

ii. Packing off the intestines.—See p. 282.

iii. Clamping and dividing the ovarian vessels and round ligaments.—The upper part of the broad ligament, containing the ovarian artery and ligament, is clamped and divided in the usual way on each side (pp. 301-304, and Fig. 231). In many of these cases, however, the uterine vessels are so elevated on the surface of the tumour that they run almost parallel with the ovarian vessels, the result being a formidable vascular leash converging towards the cornu on each side. In such

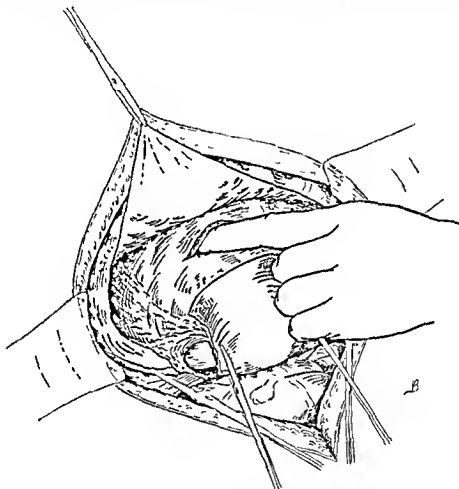


Fig. 233.—Opening the capsule of the tumour.

circumstances the separate clamping of the ovarian contingent is almost impossible, and the whole mass must be seized and divided. From the many vessels thus opened up very brisk hæmorrhage may occur, which must be immediately controlled by the application of several pressure forceps.

The clamping of the uterine vessels is merely temporary, as these vessels will presently be divided again lower down.

In some cases the ovarian vessels can be isolated by first dividing

the round ligament and then inserting the finger through the hole in the peritoneum, thus undermining them and lifting them up, when they are easily secured.

iv. *Dissecting down the anterior flap of peritoneum.*—An incision is made between the points where the round ligaments have been divided

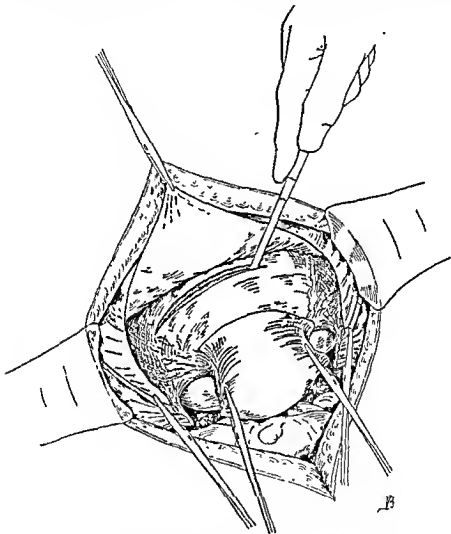


Fig. 234.—Enlarging the opening in the capsule of the tumour.

through the upper limit of the loose peritoneum in front of the uterus and well above the level of the bladder reflection (Fig. 232). The bladder is then separated, together with the anterior flap of peritoneum, from the surface of the expanded supravaginal cervix. Special care must be taken to see that the bladder is not injured, as it will probably be very much displaced upwards.

v. Ascertaining the plane of cleavage.—The capsule of the tumour formed by the tissues of the expanded supravaginal cervix is next incised transversely with a scalpel for about 2 inches. The index finger of the right hand is inserted through the incision and the exact plane of separation between the tumour and its capsule is defined (Fig. 233).

vi. Enlarging the incision in the capsule.—The incision is now extended across the supravaginal cervix (Fig. 234).

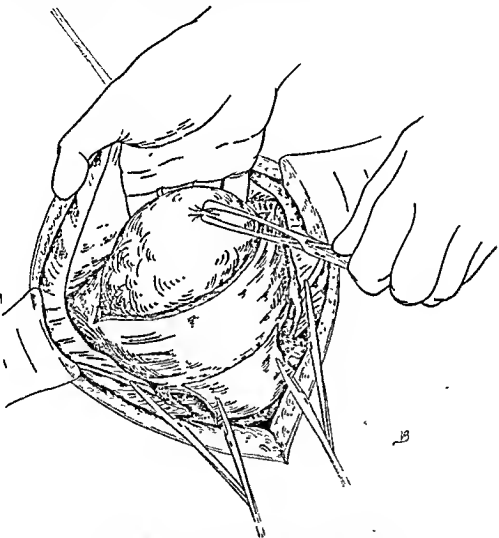


Fig. 235.—Enucleating the base of the tumour.

If the operator is in any doubt as to the position of the bladder, he should have a sound passed into this organ, since it is when incising the capsule of the tumour that the bladder is most often injured.

vii. Partial enucleation of the tumour.—A volsellum is fixed in the anterior surface of the tumour, now exposed through the incision in its capsule, and it is then pulled upwards as much as possible while

the operator continues the enucleation down to the base of the tumour by passing the fingers of the right hand between the tumour and its bed (Fig. 235).

viii. Amputation of the uterus together with the tumour.—The capsule

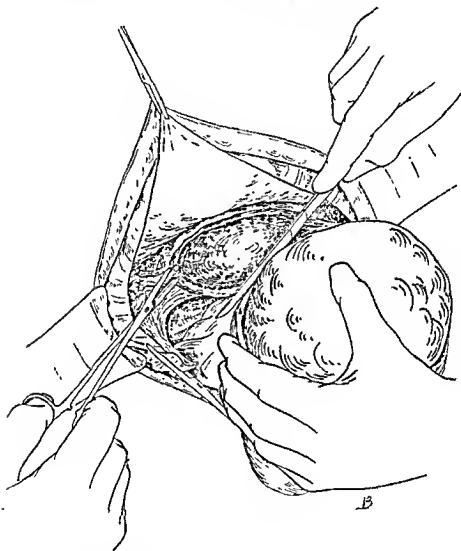


Fig. 236.—The amputation: Securing the left uterine artery.

and expanded supravaginal cervix are now incised by successive cuts towards the left, and in the course of this procedure the uterine vessels on the assistant's side are divided and immediately clamped (Fig. 236).

The incision is then extended round the back of the expanded supravaginal cervix to meet its beginning in front, the enucleation of the tumour being meanwhile continued. The uterine vessels on the

operator's side are the last to be divided, and can usually be secured by the assistant before the uterus and tumour are finally separated (Fig. 237).

ix. Ligature of the ovarian and uterine vessels.—See pp. 307-310.

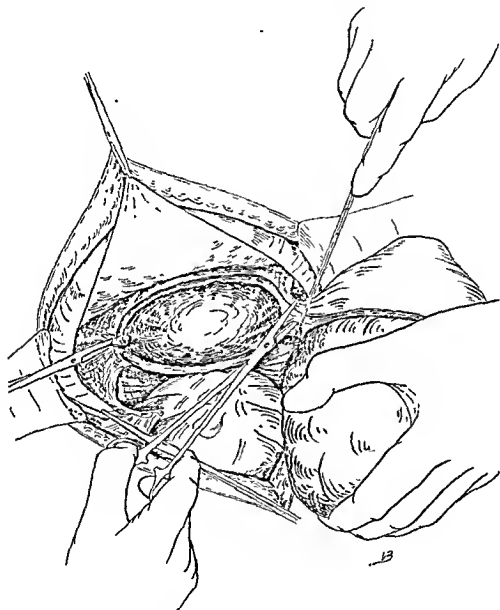


Fig. 237.—Completing the amputation: Securing the right uterine artery.

x. Treatment of the stump.—The stump, which in these cases consists of the expanded supravaginal cervix surrounding the cavity from which the tumour has been enucleated, is now trimmed with scissors, all

the uterus is pulled up with a volsellum and an incision is made across the anterior surface of the expanded supravaginal cervix through the capsule of the tumour. With the fingers of his right hand the operator then gradually enucleates the entire tumour, pulling upon it at the same time with a volsellum held in the left hand (Fig. 239).

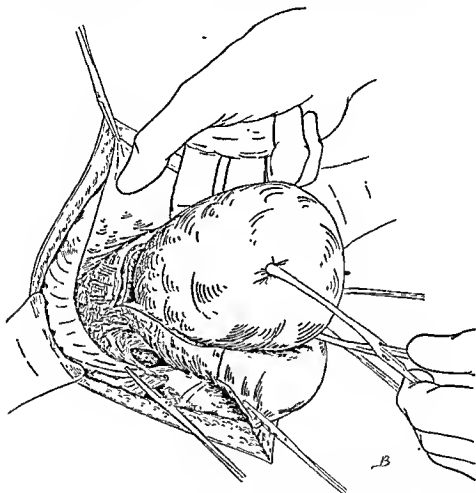


Fig. 239.—Hysterectomy for a central cervical myoma by transverse incision and total enucleation.

vi. Clamping the uterine arteries and amputation of the uterus.—The uterus with its collapsed supravaginal cervix can now easily be pulled through the abdominal incision. The lower edge of the incised capsule being secured with pressure forceps which the operator holds in his left hand, the assistant pulls on the uterus, and the operator, having clamped both uterine arteries, amputates the uterus with a pair of scissors (Fig. 240). Whether a total or a subtotal hysterectomy is performed depends rather upon how much the vagina has been

stretched. As the uterus is being amputated the surgeon will find either that he is cutting through the vagina, in which case a total hysterectomy will be performed, or that he is cutting through a very dilated supravaginal cervix, in which case the hysterectomy is subtotal, for it is often difficult to distinguish between the collapsed cervix and

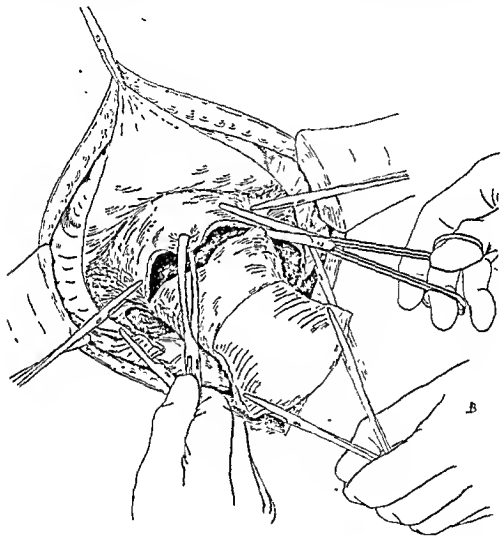


Fig. 240.—Amputating the uterus.

the vagina. In either case, after the uterus is removed two cavities may be seen. One, the expanded supravaginal cervix or the vagina, and the other—which may lie in front, behind, or to the side of it—the lower pole of the capsule of the tumour. The cavity of the tumour is now closed by a series of mattress-sutures, which should also be made to occlude the vagina if the amputation has been total.

vii. Ligaturing the uterine and ovarian arteries and round ligament and suturing the peritoneal flaps.—See pp. 307-313.

viii. Closing the abdominal cavity.—*See* p. 286.

Difficulties.—*See* pp. 313 and 342.

Dressing and after-treatment.—*See* p. 24 and Chapter xxx.

III. HYSTERECTOMY FOR A CENTRAL CERVICAL MYOMA BY HEMISECTION OF THE UTERUS

General remarks.—Frequently, central cervical myomata are best removed by hemisection of the uterus followed by hysterectomy, a technique originally introduced by Rutherford Morrison. This method

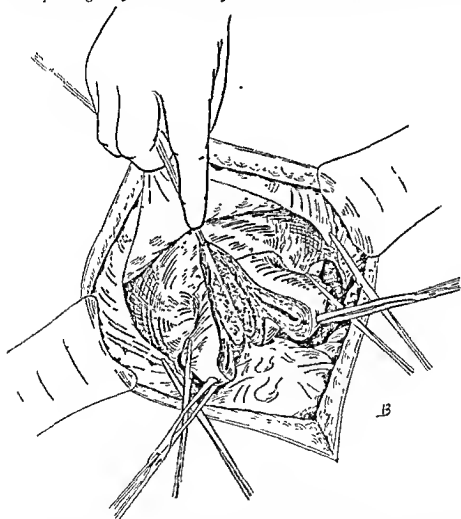


Fig. 241.—Hysterectomy for a central cervical myoma by hemisection of the uterus.

is particularly indicated when the tumour, either central or posterior, raises the bladder so that on the abdomen being opened the utero-vesical pouch is found obliterated and the uterus is so covered by the bladder that only its fundus presents. In such cases it is impossible to adopt

the method of transverse section of the capsule already described, as the intervening bladder cannot be sufficiently pushed down.

Preparation of the patient.—See p. 78.

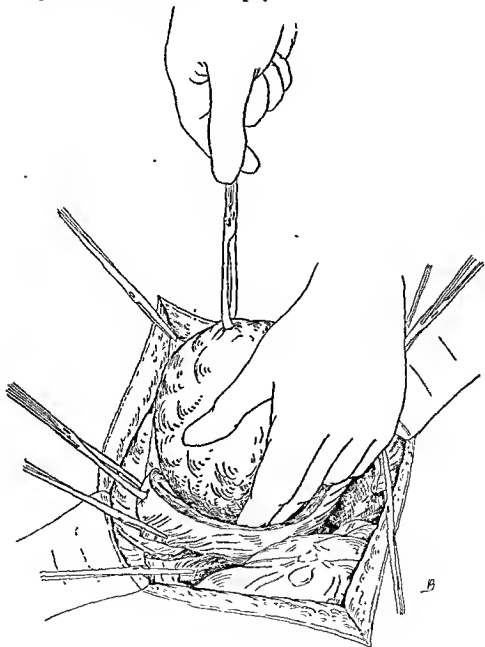


Fig. 242.—Enucleating the tumour.

Instruments.—See general list, p. 274.

Operation. i. *Abdominal incision.*—The abdominal cavity is opened by the method described at p. 274, particular care being taken not to wound the bladder, which is much raised in these cases.

ii. Packing off the intestines.—See p. 282.

iii. Clamping and dividing the ovarian vessels and round ligaments.—See p. 337 (Fig. 231).

iv. Separation of the anterior peritoneum and bladder.—An incision is made from one round ligament to the other at the level of the upper limit of the loose attachment of the peritoneum where it is stretched

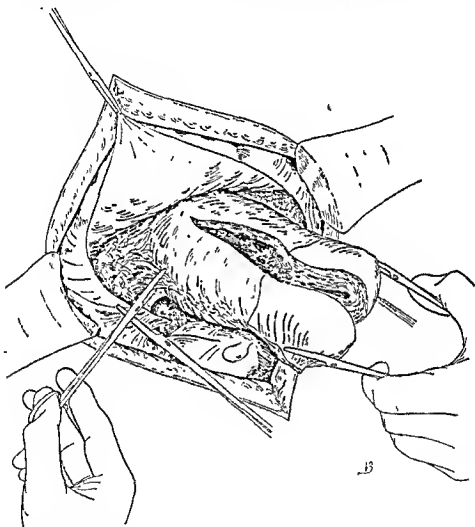


Fig. 243.—Securing the uterine artery prior to amputating the uterus.

over the tumour and the anterior surface of the uterus. The peritoneum, together with the bladder, is now pushed downwards with a swab as far as possible from off the face of the expanded supravaginal cervix (Fig. 232).

v. Hemisection of the uterus.—The operator then seizes the fundus on each side with volsellum forceps; he hands the left pair of forceps

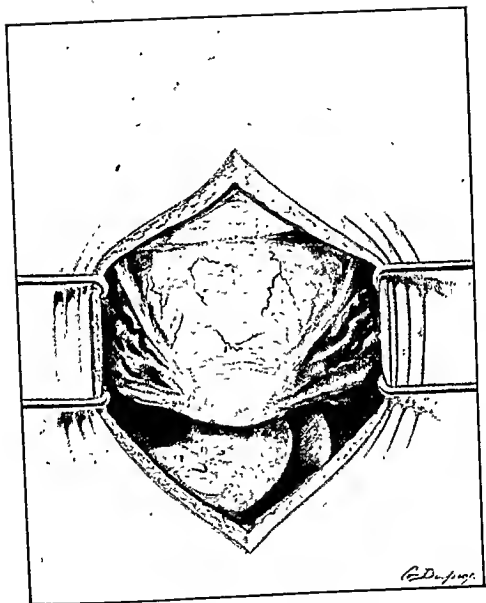


PLATE V.—Central Cervical Myoma.

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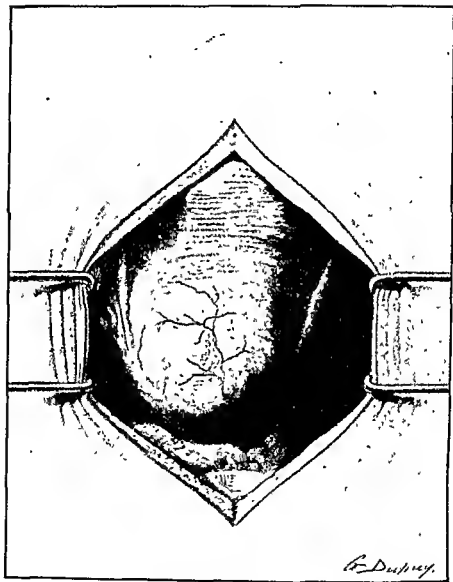


PLATE VI.—Myoma of the Anterior Uterine Wall and Cervix.

to his assistant, and, grasping the right pair in his left hand, steadies the uterus and divides its body in half with a scalpel, the incision being carried downwards well into the tumour so that the plane of its capsule is easily distinguished (Fig. 241).

vi. Enucleating the tumour.—The capsule having been defined, the tumour is seized with a volsellum and enucleated entire by means of the fingers (Fig. 242).

vii. Securing the uterine vessels and amputating the uterus.—The bisected uterine body, together with the collapsed cervix, is now easily pulled up and the uterine arteries are secured in the usual way. The amputation is then effected either through the cervix or through the vagina, according to whether a subtotal or total hysterectomy is required (Fig. 243).

viii. Closing the abdominal cavity.—See p. 286.

Difficulties.—Those described at pp. 313 and 342.

Dressing and after-treatment.—See p. 24 and Chapter xxx.

IV. HYSTERECTOMY FOR AN ANTERIOR CERVICAL MYOMA

General remarks.—An anterior cervical myoma takes up one of two positions: either it undermines the bladder and elevates it on its upper surface, or it forces its way up between the peritoneum covering the posterior wall of the bladder and the musculature of the viscus. In the first case, unless the displacement of the bladder is appreciated, it will stand a good chance of being wounded when the parietal incision is made. In the second case, unless all the loose peritoneum covering the front surface of the expanded supravaginal cervix and uterus is utilized in the formation of the anterior peritoneal flap, it will be found that at the close of the operation there is insufficient peritoneum to cover the denuded posterior wall of the bladder and the upper surface of the stump. It should also be borne in mind that the round ligaments, especially in the case of the anatomical displacement first mentioned, may be so elevated that they form the highest ridge in the broad ligament, and that, by the tumour bulging into the wound and retroverting the body of the uterus, the landmarks of the ovary and the Fallopian tubes are hidden from the operator. In these circumstances we have seen the round ligaments mistaken for the fold containing the ovarian vessels, and clamped and divided as such, with the result that this division, being extended too far forwards, has opened the elevated bladder.

Preparation of the patient.—See p. 78.

Instruments.—See general list, p. 274.

Operation. i. Opening the abdominal cavity.—See p. 274.

ii. Packing off the intestines.—See p. 282.

iii. Clamping the round ligaments.—The round ligaments, having been very carefully defined, and their relation to the bladder made out, are clamped and divided close to their attachment to the uterus.

iv. Incising the peritoneum and capsule over the tumour.—The peritoneum covering the expanded supravaginal cervix, together with the round ligaments, are now divided at the upper limit of the loose

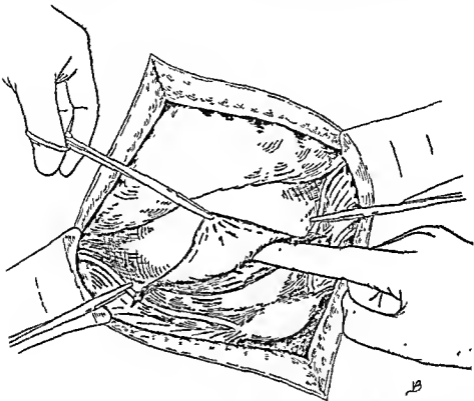


Fig. 244.—Hysterectomy for an anterior cervical myoma: Separating the anterior peritoneum.

attachment of the peritoneum to the uterus, this point being, if necessary, defined beforehand by undermining the peritoneum with the finger. The incision commences on the left-hand side just external to the point where the round ligaments are clamped, and extends to a similar point on the side (Fig. 244). The anterior peritoneal flap is now pushed off the surface of the expanded supravaginal cervix until the reflection of the bladder is reached, and the capsule of the tumour is then divided just above the level of the bladder attachment. It must be remembered that no myoma, however superficially placed, is truly subperitoneal; there is always a thin layer of expanded uterine muscle covering it.

v. Enucleation of the base of the tumour.—The peritoneum and capsule are now together carefully pushed off the face of the tumour, which is

gradually enucleated with the first and second fingers of the right hand as far as its base, care being taken not to injure the bladder. This enucleation is assisted by fixing the volsellum to the tumour and pulling on this with the left hand (Fig. 245).

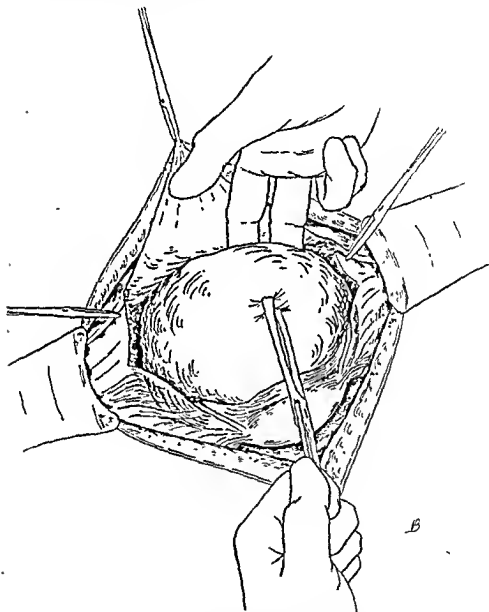


Fig. 245.—Enucleating the tumour.

vi. Securing the ovarian vessels.—Directly the tumour has been raised from its bed, the upper parts of the broad ligaments containing the ovarian vessels are brought into view. These are divided on each side between two pairs of forceps in the usual way (Fig. 246).

vii. Clamping the uterine vessels and amputation of the uterus.—The tumour, together with the uterus, is drawn out of the wound. The uterine vessels are then clamped on each side and the uterus amputated through the cervix with a scalpel. If a total hysterectomy is desired, the anterior vaginal wall should first be opened, as described at p. 324.

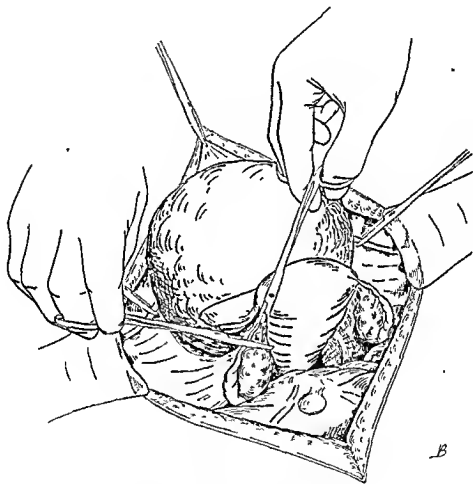


Fig. 246.—Clamping the ovarian vessels.

viii. Ligaturing the vessels.—See pp. 307-310.

ix. Treatment of the stump.—See pp. 308-342.

x. Suturing the peritoneal flaps.—See p. 311.

xi. Closing the abdominal cavity.—See p. 256.

Difficulties.—Those described on pp. 313 and 342.

Dressing and after-treatment.—See p. 24 and Chapter xxx.

V. HYSTERECTOMY FOR A POSTERIOR CERVICAL MYOMA

General remarks.—The methods of dealing with a posterior cervical myoma are two, depending upon its variety, as described at p. 334. If the rarer form therein described is present, when the tumour, undermining the peritoneum at the bottom of Douglas's pouch, strips the

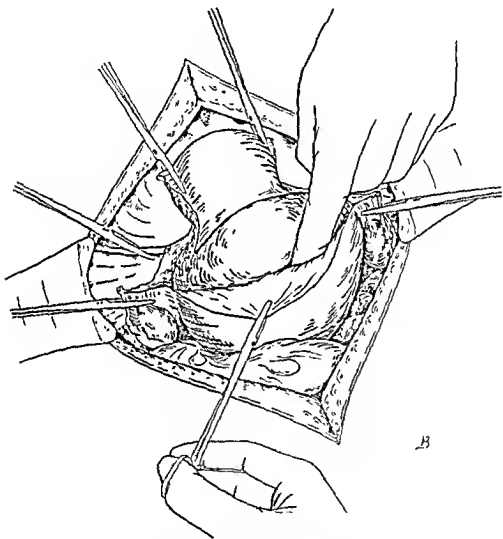


Fig. 247.—Hysterectomy for a posterior cervical myoma: Reflecting the posterior peritoneum.

serous membrane off the anterior face of the sacrum and rectum, and pushes down between the vagina and rectum, or by the side of the latter, the uterus will be found to have been bodily elevated on the myoma in a position of retroversion. In this case the bladder will be found entirely to overlie the front of the mass, and the best technique to adopt will be to bisect the uterus in the manner previously described (see p. 346). The bisection will be principally carried out down the posterior wall

of the uterus, since the presence of the bladder in front generally prevents the incision being carried very far down the anterior wall.

If the tumour be of the commoner variety, namely, that bulging back into the pouch of Douglas, the method about to be described should be followed.

Preparation of the patient.—See p. 78.

Instruments.—See general list, p. 274.

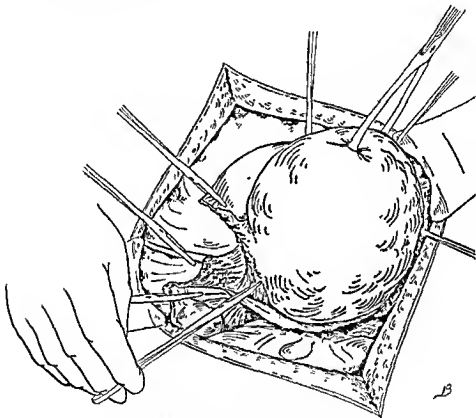


Fig. 248.—Clamping the uterine artery.

Operation. i. Opening the abdominal cavity.—See p. 274.

ii. Packing off the intestines.—See p. 282.

iii. Clamping and dividing the ovarian vessels and round ligaments.—

These are clamped, divided and tied as described on p. 337.

iv. Incising the peritoneum and capsule.—The peritoneum and capsule at the junction of the tumour with the posterior surface of the uterus are incised and reflected (Fig. 247).

v. Enucleation of the base of the tumour.—The tumour being pulled forwards by the volsellum, the fingers are now forced between the capsule and the tumour, and the latter is enucleated down to its lower pole. To effect this, the fingers may in difficult cases have to be inserted a distance equal to almost the whole length of the vagina.

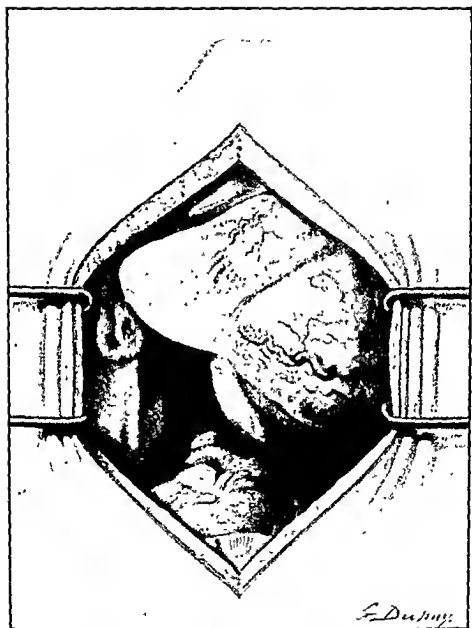


PLATE VII.—Myoma of the Right Broad Ligament.

vi. Reflecting the anterior flap of peritoneum towards the bladder.—The peritoneum over the anterior surface of the supravaginal cervix is next reflected as far as the attachment of the bladder.

vii. Clamping the uterine vessels and amputating the uterus.—Strong traction is now made on the tumour, which together with the freed uterus can be easily pulled up with a volsellum so that the uterine vessels on each side are brought into view and then clamped (Fig. 248), after which the uterus is amputated in the way described for subtotal hysterectomy, or, if total removal is desired, then by first opening the anterior vaginal vault.

viii. Ligaturing the ovarian and uterine vessels.—See pp. 307-310.

ix. Treatment of the stump.—If the posterior peritoneal flap and the capsule of the tumour are redundant, as they usually are, they are trimmed with scissors, after which the stump is sutured in the manner described at pp. 308 and 341.

x. Suturing the peritoneal flaps.—See p. 311.

Difficulties.—Those described on pp. 313 and 342. It is most important to get into the plane of cleavage between the tumour and its capsule of expanded cervical muscle.

Dressing and after-treatment.—See p. 24 and Chapter xxx.

VI. HYSTERECTOMY FOR BROAD-LIGAMENT MYOMATA

General remarks.—Broad-ligament myomata are divisible into two classes. The *first variety* is the true broad-ligament myoma, and springs from the muscle-fibres normally found in the mesometrium. Such tumours may, therefore, be found in at least three situations :

1. In the round ligament.
2. In the ovario-uterine ligament.
3. In the connective tissue surrounding the ovarian or uterine vessels.

As a rule, tumours growing in the first two situations are of small size, and can be enucleated as described in Chapter xviii. Tumours growing in the third situation frequently attain a large size; they distend the broad ligament so that the Fallopian tube is stretched and lies sessile on their upper surface as in a broad-ligament cyst. Having exhausted the capacity of the broad ligament, the tumour pushes its way upwards, stripping the peritoneum off the lateral wall of the pelvis and iliac fossa, and on the left side often, in addition, burrowing between the layers of the pelvic mesocolon, the bowel itself then lying sessile upon the tumour. If the operator is not familiar with the anatomy of these tumours he may believe that this condition of the bowel is due to adhesions, and may abandon the attempt to remove the tumour, when, as a matter of fact, a plane of easy cleavage lies between the muscularis of the intestine and the surface of the tumour.

True tumours of the broad ligament can be distinguished by the fact that they are entirely separate from the uterus, which they displace but do not deform. Their relation to the uterine artery should be remembered; it lies beneath and on the inner side of the tumour, while the ureter is displaced inwards, and will be found running in the posterior peritoneal layer of the broad ligament, after leaving which it courses under the tumour to reach the bladder.

There are two methods of dealing with true broad-ligament myomata. The tumour may be enucleated in the manner described on pp. 453-454. If the tumour is very large, vascular or adherent, it may be necessary to remove the uterus in addition, principally as a means of easily controlling the hæmorrhage. This method will be described in the operation for the second variety of broad-ligament myoma.

This *second variety* may be termed the "false" broad-ligament myoma. In this case the tumour springs from the lateral wall of the uterine body or of the cervix, and bulges outwards between the layers of the broad ligament. The uterus is, therefore, part and parcel of the tumour. These tumours distend the broad ligament, and also at times raise the lateral pelvic peritoneum and invade the mesocolon.

Besides its relation to the uterus, the second variety differs from the first variety in that it displaces the uterine artery outwards and upwards, so that in extreme cases the uterine and ovarian vessels are approximated and run a parallel course on the top of the tumour. The ureter is displaced outwards to the pelvic wall and, as a rule, lies under the tumour, except in the rare lateral cervical myomata already referred to, when, together with the lateral angle of the bladder, it may be undermined by the tumour and elevated on its upper surface. These tumours can be enucleated, but when large or associated with other fibroids in the uterus it is often best to deal with them by hysterectomy.

It is better, if possible, to begin the removal of the tumour by attacking the healthy side of the uterus. The reasons for this are, in the first place, that hæmorrhage can be better controlled, and, secondly, that the uterus itself constitutes the firmest attachment of the tumour which is elsewhere surrounded by cellular tissue and peritoneum. The greatest difficulty in these cases is the control of the uterine vessels on the side of the tumour, and it is often impossible to secure them until the tumour is removed from the field of view. The concluding stage of its removal has, therefore, often to be effected as quickly as possible, and this is materially aided by the previous amputation of the uterus and clamping of the uterine vessels on the healthy side. We shall proceed to describe this operation.

Preparation of the patient.—See p. 78.

Instruments.—See general list, p. 274.

Operation. i. Opening the abdominal cavity.—See p. 274.

ii. Clamping and dividing the upper parts of the broad ligaments on the healthy side.—*See* p. 301.

iii. Stripping the anterior peritoneal flap.—The peritoneum is incised across the uterus and tumour; the incision, commencing at the healthy

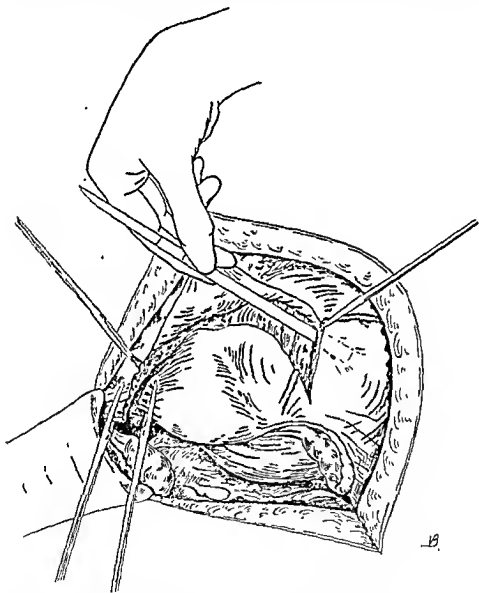


Fig. 249.—Hysterectomy for a broad-ligament myoma : Separating the peritoneum off the upper pole.

side and passing across the tumour, divides the round ligament, and is extended upwards to just short of the ovarian vessels. The peritoneum is now stripped from the upper surface of the tumour as far as possible, and the bladder is pushed down (Fig. 249).

iv. Clamping the ovarian vessels on the diseased side.—The index

finger of the operator's left hand is then inserted between the cut edges of the peritoneum and forced under the Fallopian tube and ovarian vessels, which are thus separated from the tumour. The upper parts of

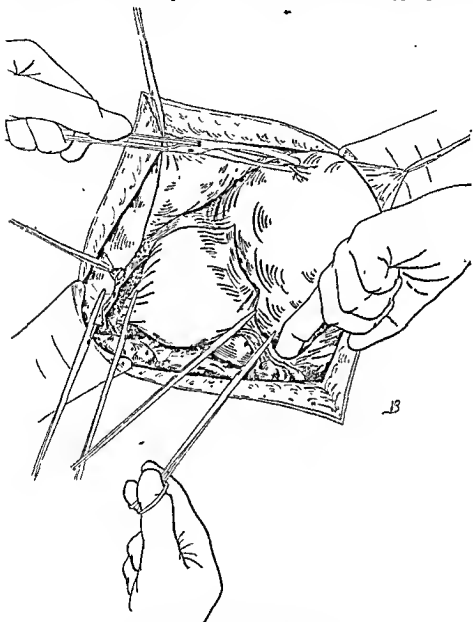


Fig. 250.—Continuing the separation.

the broad ligament and the round ligament are then divided between forceps (Fig. 250).

v. Freeing the upper part of the tumour.—The upper part of the tumour is now freed from its attachments, leaving merely its base.

vi. Clamping the uterine vessels on the healthy side.—The uterus and tumour being now strongly pulled over to the side of the tumour, the uterine vessels on the healthy side are clamped and divided. See p. 304.

vii. Amputating the uterus.—The fundus of the uterus is drawn over

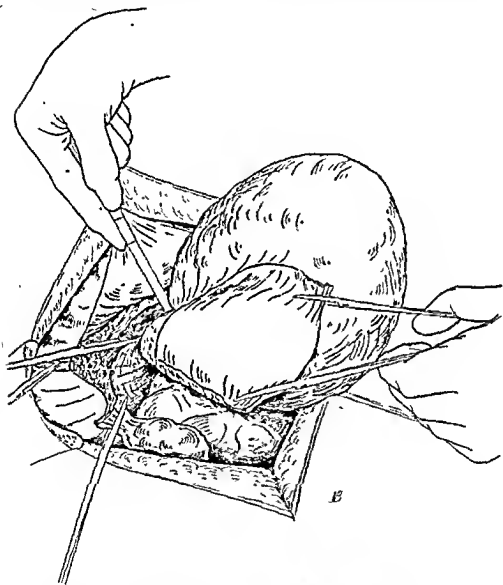


Fig. 251.—Amputating the uterus : The left uterine artery secured.

towards the side on which the tumour lies, and the uterus is amputated at the level of the internal os (Fig. 251).

viii. Dividing and clamping the uterine vessels on the diseased side.—Just before the amputation is completed, the uterine vessels on the same side of the tumour come into view. These vessels are then cut through and as they spurt are clamped with pressure forceps (Fig. 252).

ix. Removal of the uterus and tumour.—The assistant pulls the uterus strongly towards the side of the tumour, and the operator, passing

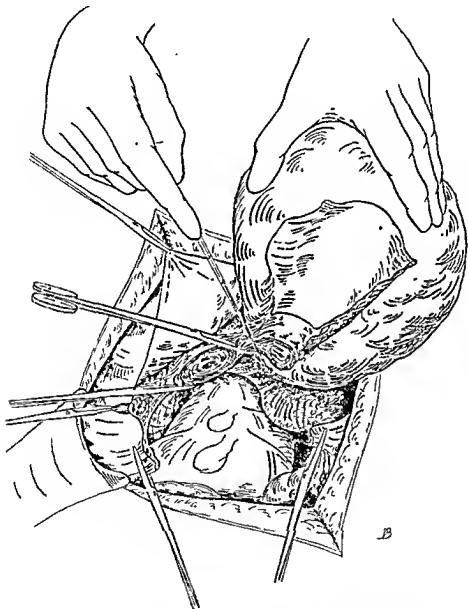


Fig. 252.—Completing the amputation: Securing the right uterine artery.

the fingers of his left hand between the tumour and the base of the broad ligament, frees its lower surface and thus enucleates it.

x. Ligaturing the uterine and ovarian vessels, and round ligaments.—
See pp. 307-310.

xi. Obliterating the cavity of the broad ligament.—All redundant peritoneum being removed with scissors, it will usually be found that the suture of the peritoneal flaps can be immediately proceeded with. The cavity, or a large part of it, can be closed by inserting a continuous mattress-suture of catgut through the peritoneal flaps in the manner shown in Fig. 253, care being taken to avoid the ureter. When the cavity extends deeply into the broad ligament, or extends downwards between the vagina and lateral pelvic wall, or between the vagina and

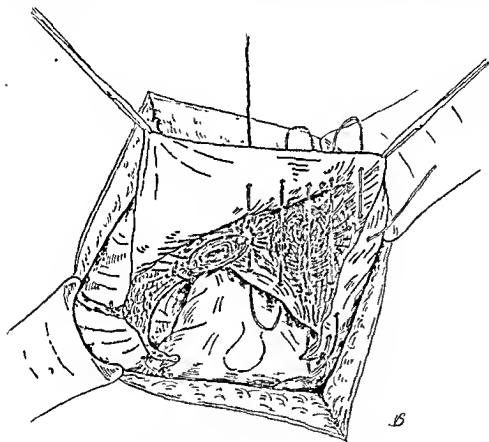


FIG. 253.—Closing the enucleation cavity.

rectum, it is impossible to obliterate this cavity entirely, as the passage of sutures is fraught with the danger of wounding the bladder, ureter, or great vessels. In such a case, all bleeding-points having been secured, the cavity must be left, after its size has been reduced by cutting away as much redundant peritoneum as possible.

xii. Closing the abdominal cavity.—See p. 286.

Alternative method.—Occasionally a fibroid, lateral to the uterus, so displaces that organ downwards and to the opposite side that the vessels on the healthy side cannot be reached in the manner described. In such circumstances the tumour must first be enucleated—or partly enucleated

—after the ovarian vessels spread out on its upper surface have been clamped and divided. During the enucleation the fingers must be kept close to the tumour. The enucleation effected, the uterus rides up, and the vessels on the healthy side become accessible.

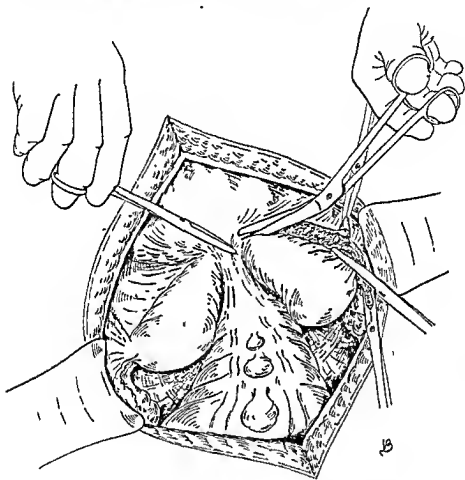


Fig. 254.—Hysterectomy for a double uterus: Dividing the vesico-rectal fold.

Difficulties and dangers.—The difficulties may be some of those which are mentioned in the sections dealing with broad-ligament cysts and cervical myomata. The operator must remember the various displacements to which the ureter is liable, and, if he cannot be sure of its exact position, must minimize the danger of wounding it by keeping as close to the tumour as possible while enucleating it. It is very important to ligature all bleeding-points in the cavity left after the removal of the tumour, otherwise a large hæmatoma may form.

Dressing and after-treatment.—See p. 24 and Chapter xxx. Where

is impossible to obliterate more than a part of the enucleation cavity, vaginal examination, 10 days or more after the operation, will usually reveal a mass in the area of enucleation, due to effused blood or serum. It should be left alone, as it almost invariably absorbs.

VII. HYSTERECTOMY WITH A DOUBLE UTERUS

The technique of hysterectomy for a double uterus does not materially differ from that proper for the single organ except in certain particulars. When two complete organs are present (*uterus duplex*) a pronounced fold of peritoneum exists which joins the bladder to the rectum in the middle line, separates the two corpora, and divides the retro-rectal pouch into two lateral compartments. This fold should be divided by the same incision through the peritoneum that demarcates the anterior peritoneal flap, and the operator must make sure that the bladder is pushed well forwards and the rectum well backwards before he proceeds with the amputation (Fig. 254).

With a double corpus and a single cervix (*uterus bicorporis unicollis*) the fold may not be present.

In *uterus duplex* the two cervixes, though complete in themselves, are joined together by a block of tissue which is continued downwards as a median vaginal septum. There is only one uterine artery to each half of a double uterus.

CHAPTER XVI

THE RADICAL ABDOMINAL OPERATION FOR CARCINOMA OF THE CERVIX

THE radical operation for cancer of the cervix consists in removing, through an abdominal incision, the uterus and its appendages and, by means of a clamp, most or all of the vagina, which is made to form a bag in which the diseased cervix is encapsuled after clamping. In addition, as much as possible of the parametric and paravaginal tissue is removed from the pelvis, together with the regional glands whether they be invaded or not.

W. A. Freund, in 1878, was the first to advocate abdominal hysterectomy for cancer of the uterus, but it is to Ries, of Chicago, that we owe the development of the radical operation as it is practised to-day. In 1895, Ries, by operating on dogs and cadavers, satisfied himself and others that it would be possible to remove the uterus and its appendages, the cellular tissue of the pelvis, and the lymphatic glands as far as the bifurcation of the common iliac, without killing the patient. Clark, in 1896, put this suggestion into practice on the living woman at the Johns Hopkins Hospital, and his example was quickly followed by others, while Thring, of Sydney, independently began to practise a similar operation. The establishment of the operation as an accepted procedure was, however, due to Wertheim.

The operation from a pathological standpoint.—The advance of a carcinomatous growth takes place in two ways: first, by a gradual pressure-destruction of the tissue surrounding it, 'infiltration'; and secondly, by a growth-insinuation along trunk lymphatic channels, 'permeation.' The clear distinction between these two methods of growth was first drawn attention to by Sampson Handley, and is very important. The first is seen at the macroscopical growing edge, where a remarkably abrupt line between the carcinoma and the surrounding tissues is exhibited. The second is evidenced by the carcinomatous lymphatic glands and secondary nodules occurring at a distance from the primary growth. The distinction is exemplified by the clinical course of a rodent ulcer and an epithelioma respectively. In the first we have a growth by infiltration alone; in the second, both by infiltration and permeation. Had we to deal with a tumour growing solely by infiltration, it would be possible permanently to remove it

by an incision just outside its abrupt macroscopical margin; but growth by permeation requires a wide removal of the entire lymphatic tract to render it successful. Growth by infiltration is occurring around the whole periphery of a carcinoma, but growth by permeation only along certain well-defined lymphatic channels.

Applying these general considerations to carcinoma of the cervix, we see that the distinction between these different methods of growth is well exemplified. Thus, the bladder, rectum, and vagina are involved by infiltration, a slow process taking many months or a year or two to cross the short length of tissue that separates them from the cervix. The pelvic glands, on the other hand, are involved by permeation, a much faster method of extension, by which the many inches of tissue intervening between them and the primary growth may be spanned in a few weeks. The main lines of lymphatic conduction in the case of the cervix are few and simple, and run, as we have shown elsewhere, straight outwards through the parametrium to the obturator and external iliac glands, and downwards in the vaginal wall.

The demands of pathology are therefore satisfied by an excision so planned as to include this tract, while keeping just outside the periphery of the macroscopic growing edge elsewhere. The radical abdominal operation does this and more; and it is, therefore, a rational treatment, even when the edge of the growth is separated from the bladder or rectum by only one-twentieth of an inch of uninfiltated tissue.

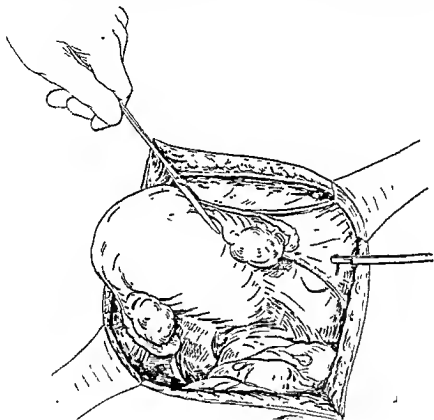
It is obvious that the larger the percentage of cases operated on out of a series seen, the larger will be the number of advanced and difficult cases dealt with, and therefore, the higher the average mortality of the operation.

On the other hand, the surgeon whose practice it is to submit every case to operation in which there appears any chance of extirpating the growth will cure a certain number of patients whom a more cautious surgeon would leave to their fate.

We have ourselves operated upon every case in which there appeared a possibility of removing the growth, and we estimate our operability-rate as 63 per cent. Although this practice has necessarily resulted in a number of cases in which the operation has had to be abandoned after opening the abdomen, and a certain proportion in which, though a most severe operation was carried through, our general primary mortality was fruitlessly increased, yet our final results, we believe, have justified the principle on which we have worked.

Primary mortality.—The chief objection to Wertheim's operation when it was first introduced was its high operative mortality. Its inventor lost 30 patients out of the first 100 he operated upon, but later on he reduced his mortality to under 10 per cent. In my own (V.B.) series of 500 operations, the results of which are given on p. 368, there were 20 operative deaths in the first 100, but the rate was down to 11

is of special assistance in counteracting the fall of blood-pressure which spinal anæsthesia occasions. Eight minutes should elapse before the patient is placed in the Trendelenburg position, her shoulders being raised and her legs flexed meanwhile. Nowadays, however, surgeons are more in favour of the modern routine of anæsthesia, pentothal induction followed by ether and gas and oxygen, the amount of ether being kept as low as possible, while Curare is used to promote relaxation. The irritant effects of ether are thereby minimised, and the patient



patient is held in the lithotomy position, the catheter is passed, and the vagina is tightly packed with gauze thoroughly soaked in Violet-green diluted with an equal quantity of water, a long tail of the gauze being left hanging out for the convenience of the nurse, who has to remove the packing at a later stage of the operation.

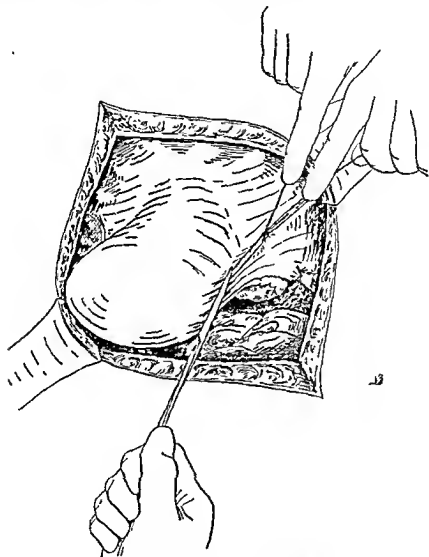


Fig. 256.—Tying the round ligament.

The object of the packing is to sterilize the vagina in anticipation of its future division, and the pack also transforms the canal into a solid column, which greatly facilitates the subsequent separation of the bladder and rectum from the vagina.

The patient is then fixed in the Trendelenburg position.

iv. Opening the abdominal cavity.—See p. 274.

The abdominal incision must be a large one, in all cases extending to the umbilicus, and in fat patients at least an inch above.

v. Packing off the intestines.—See p. 282.

vi. Preliminary inspection.—The pelvic contents should be carefully inspected before the operation is commenced, in order that the operator may gain some idea as to the difficulties he is likely to encounter and whether he is justified in attempting the operation. See p. 373.

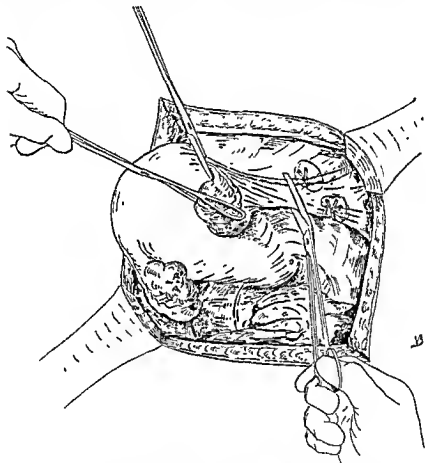


Fig. 257.—Dividing the broad ligament.

vii. Ligaturing the ovario-pelvic ligaments.—The ovario-pelvic ligaments are ligatured on each side by under-running them with a No. 4 silk ligature just where the ovario-pelvic ligament reaches the brim of the pelvis, the uterus being pulled over to the opposite side by the assistant, so that this ligament may be put on the stretch (Fig. 255). This ligature includes the ovarian artery and veins. Before passing the ligature the upper edge of the ligament should be rolled between the index-finger and thumb to ensure that the ureter, which is very superficial at this point, is not included in it.

viii. Ligaturing the round ligaments.—A ligature of No. 4 silk is passed under the round ligament on each side, and this structure is tied as far away from the uterus as possible (Fig. 256).

ix. Division of the broad ligaments.—The ovary is now grasped by a pair of ring forceps, and dragged upon so that the ovario-pelvic ligament is put upon the stretch. A pair of long Spencer Wells forceps

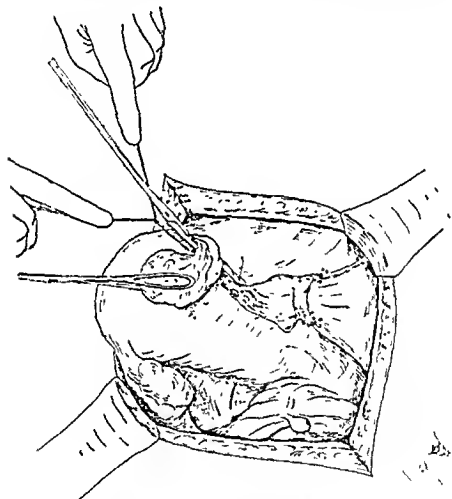


Fig. 258.—Ligature of the uterine cornu.

is then made to clamp the round ligament, Fallopian tube, ovario-uterine ligament and part of the broad ligament close up to the uterus. The broad ligament is now divided with scissors close to the ligatures on the round and ovario-pelvic ligaments, the uterine ends of the cut ovarian vessels being included in the forceps (Fig. 257). The same is done on the opposite side.

x. Ligaturing the uterine cornua.—A ligature of No. 6 silk is now passed round the uterine end of the cut structures and tied at one cornu of the uterus, thus taking the place of the forceps. The Fallopian

tube and ovary should now be pulled across the fundus of the uterus and included in the same ligature. The appendage is thus bunched up away from the field of the next step of the operation. The same is done on the other side. The ends of each ligature should be left long and clamped together with forceps to form a very efficient tractor (Fig. 258).

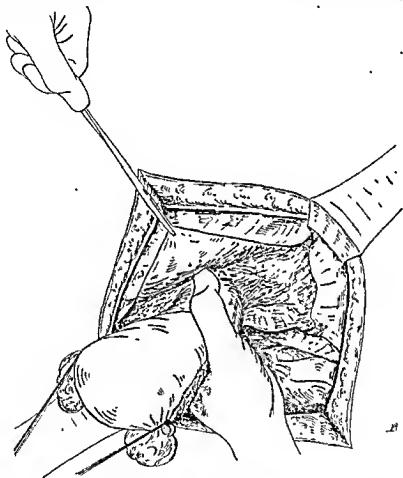


Fig. 259.—Separating the bladder.

xi. Religature of the ovarian vessels.—It sometimes happens that a red infarct forms where the ovarian vessels have been ligatured in the ovario-pelvic ligaments. This can be obviated by a surround ligature placed on the pedicles after the broad ligament has been divided (*see p. 42*).

xii. Preliminary separation of the bladder from the cervix.—The upper limit of the loose attachment of the peritoneum, on the anterior surface of the uterus, is identified by running the forefinger under the loose peritoneum in front of the uterus. The peritoneum is then divided across this upper limit and the plane of cleavage between the

bladder and vagina is exposed. The peritoneal flap, having been seized with a pair of forceps, is reflected till the bladder is reached. The bladder is then separated from the cervix and upper part of the vagina by thumb-pressure, the nail of the thumb being kept towards the bladder while the pulp of the thumb is pressed against the cervix and packed vagina, the fingers behind the vagina in the pouch of Douglas making counter-pressure (Fig. 259).

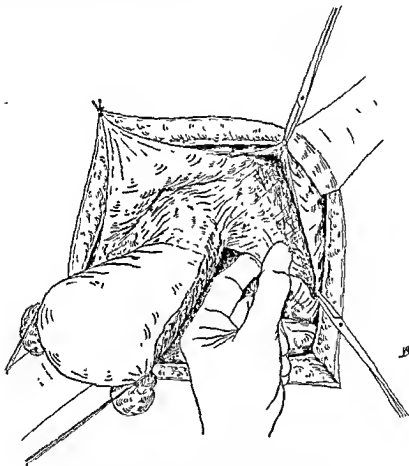


Fig. 260.—Feeling for the right ureter.

If the bladder is not involved, this separation takes place quite easily. If necessary the thumb-pressure can be supplemented by cautious snips of the muscle-fibres with the scissors, the points of which should be kept directed towards the vaginal wall. If the bladder is adherent, on account of extension of the growth or inflammation, the greatest caution will be required if the bladder is to escape injury, and the broad-flat-retractor should be used to hold back the bladder and fully to expose its attachment to the vagina.

The separation should be at first limited to one inch in the middle line, and rather less at the sides.

The operator, having assured himself that the bladder is separable, pulls up the reflected anterior peritoneal flap in the middle line and temporarily fastens it by a suture to the lower angle of the abdominal wound so as to keep the bladder out of the way.

xiii. Enlarging the opening in the broad ligaments.—Access to the

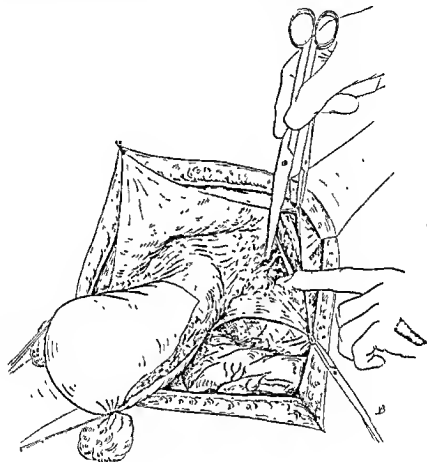


Fig. 261.—Finding the uterine artery.

structures in the base of the broad ligaments is now obtained by dividing the peritoneum between the ligatures on the stump of the round and ovario-pelvic ligaments respectively, in a line parallel with and outside the ovarian vessels. Forceps are now placed on these two stumps, and pulled upon, while with his finger, and a pair of blunt-pointed scissors if necessary, the operator divides the loose areolar tissue until he can plainly see the external iliac vein as it runs along the side wall of the pelvis.

xiv. Identifying the ureter.—The posterior peritoneal layer of the broad ligaments is then rolled between the thumb and index finger,

when the ureter will be felt, about the size of a crow quill, as it slips free of the finger and thumb. The depth at which the ureter lies varies considerably, but its feel is unmistakable. It is most superficial in the region of the ovarian ligature (Fig. 260).

xv. Ligaturing the uterine artery.—There are four methods of securing the uterine artery.

1. In the simplest method the operator takes the external iliac vein as his guide, and by teazing the tissues searches for the obliterated hypogastric artery which runs parallel with, and inside, the external

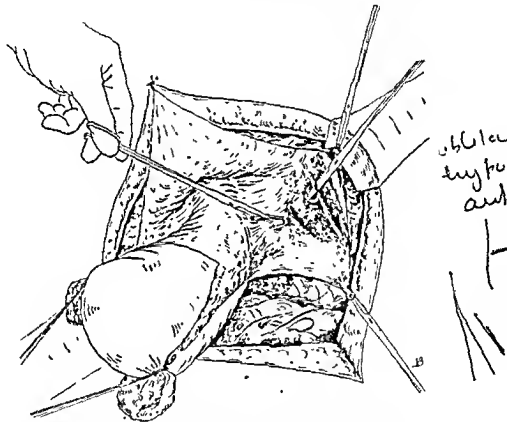


Fig. 262.—Uterine artery divided and ureter exposed.

iliac vein, about one inch deeper down. When the obliterated hypogastric artery is found, the uterine artery will, as a rule, be seen coming off from it at a right angle (Fig. 261).

2. Sometimes the uterine artery, instead of coming off the hypogastric artery at right angles, comes off at an oblique angle much nearer to the internal iliac trunk, and runs towards the uterus parallel with and above the ureter. In this case the uterine artery will not be identified until the ureter is exposed, as it lies on the peritoneum.

3. If the uterine artery is not found by methods 1 or 2, the operator should push his forefinger gently through the cellular tissue between

the internal iliac artery and the ureter, and hook the last joint upwards and forwards, when the uterine artery will be lifted on the pulp of the finger.

4. In advanced cases the cellular tissues may be so infiltrated that the uterine artery cannot be identified by any of the foregoing methods. In this event the operator should follow the obliterated hypogastric

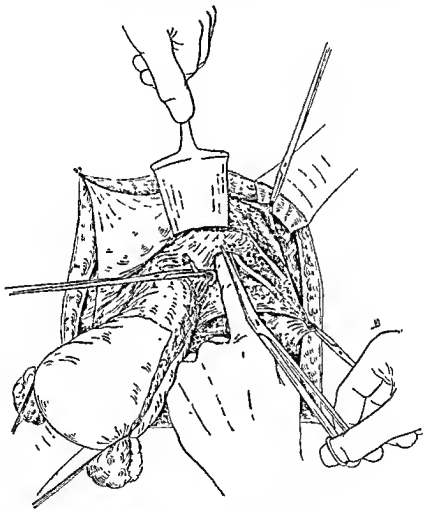


Fig. 263.—Dividing the roof of the ureteric canal.

artery back to the internal iliac trunk, pass a silk ligature round the trunk by means of an aneurysm-forceps or a curved blunt Reverdin's needle, and tie it. In some cases the ureter can be traced from before backwards, starting at its junction with the bladder.

The uterine artery, having been defined, is elamped and divided between two artery forceps, and the proximal end is immediately tied (Fig. 262).

xvi. Exposing the ureter under the uterine artery.—By traction on the forceps still holding the distal end of the divided uterine artery, this vessel is rucked back towards the uterus, thereby exposing the ureter beneath it (Fig. 262).

The distal end of the uterine artery is then ligatured.

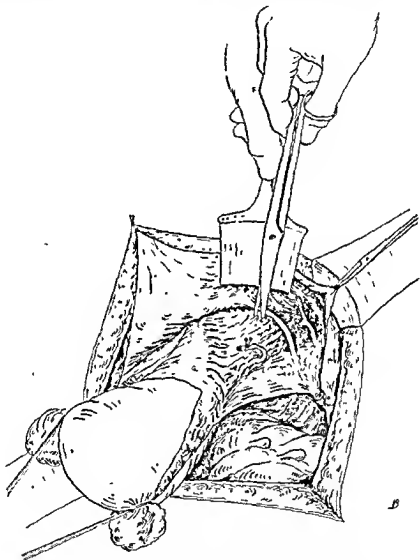


Fig. 264.—Completing the separation of the ureter.

The uterine artery on the opposite side is ligatured and the ureter exposed by similar procedures.

xvii. Isolation of the ureters.—The lower 2 inches of the ureter, up to its junction with the bladder, must be completely isolated, since, unless this is done, the cardinal ligament which lies below it cannot be exposed and safely divided. If it can possibly be avoided, care should be taken not to isolate more than 2 inches of the ureter for

fear of its necrosis. The isolation of the ureter is accomplished as follows. First the roof of the uterine canal is divided by a series of scissor-snips, between each of which the finger tip pushes the ureter outwards, to avoid injuring it. The entrance to this canal is identified by following the ureter downwards with the tip of the index finger, which, if the tissues are not infiltrated, will easily enter the canal (Fig. 263). The 2 inches of the ureter having been exposed by division

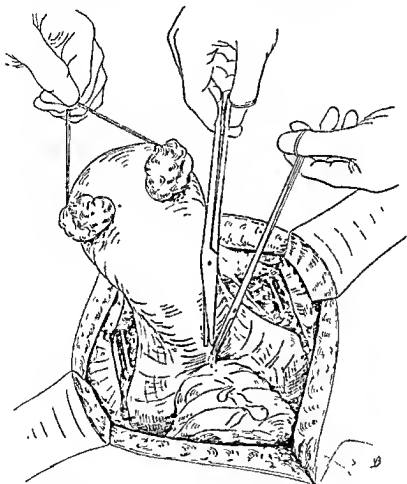


Fig. 265.—Dividing the peritoneum posteriorly.

of the roof of the canal, the ureter is then partly isolated by scissor-snips along its inner side and still further pushed outwards (Fig. 264). Meanwhile a broad flat retractor holds back the bladder so that a clear view of the parts is obtained. The ureter on the opposite side is then treated in the same way. The manœuvre described needs to be done very dexterously, and the ureter should not be pulled on and kinked, for if this is done it stands a good chance of being cut.

In difficult cases the ureter is so adherent to the indurated tissue that surrounds it that a canal *does not* exist. In such circumstances the exposure must be carried out by a series of gentle snips, keeping careful watch as the ureter comes into view. The roof of the canal always contains an artery and several large veins, which must be ligatured.

At times, when the ureter is surrounded by much infiltration, it can

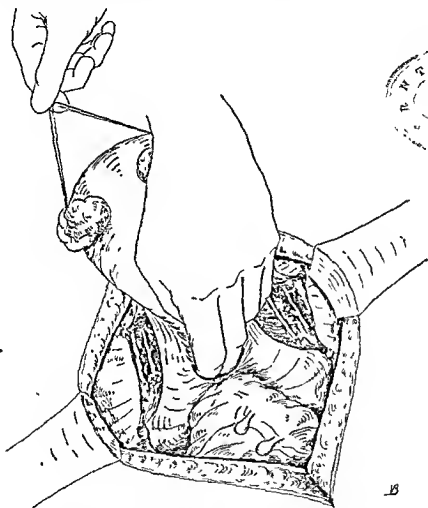


Fig. 266.—Separating the vagina from the rectum.

be dissected out only with great difficulty, and sometimes this is altogether impossible. In both these cases, the ureter should be divided clear of the induration and implanted into the bladder.

xviii. Further separation of the bladder.—The exposed and partly isolated ureter is now raised by the aneurysm needle previously passed under it, or by the fingers, and completely detached, by cautious snipping, from the bed in which it lies, until it is entirely isolated. This step is combined with a further separation of the bladder from the vagina, a

procedure facilitated by the assistant pressing back the bladder with a broadfaced retractor, while the operator, by a series of scissor-snips, aided by thumb-pressure in the manner already described, still further separates it and the uretero-vesical junctions from the vagina and the tissues lateral to it. All cut vessels having been ligatured, the surgeon proceeds to isolate the ureter of the opposite side in the same way.

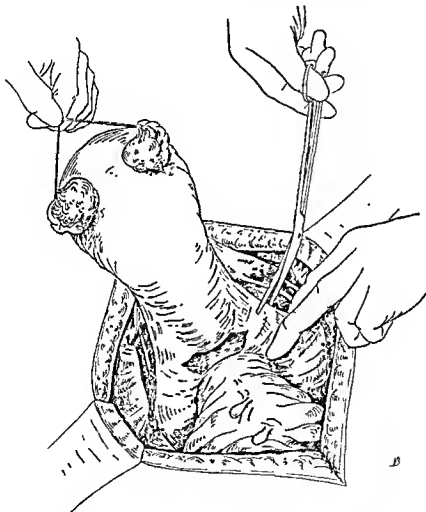


Fig. 267.—Dividing the peritoneum on the back of the right broad ligament.

xix. Separation of the vagina from the rectum.—The uterus is now pulled forwards, and the peritoneum on the anterior wall of Douglas's pouch, having been picked up in the middle line, is cut through with scissors just below the point where it becomes fixed to the cervix (Fig. 265). Into the hole thus made, the operator pushes the first and second fingers of his left hand, keeping their pulps pressed against

the solid column formed by the packed vagina, and so separates the rectum from it in the middle line (Fig. 266). When infiltration does not exist, the plane of cleavage is easily found, and the bowel can readily be stripped off the vagina down to the levator floor. It is essential to keep the finger pulps pressed hard against the packed

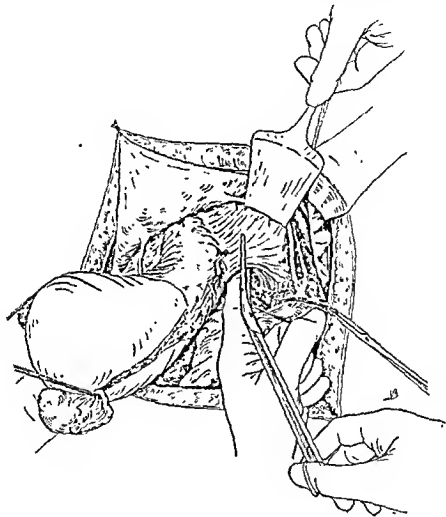


Fig. 268.—Dividing the right cardinal ligament.

vagina while the separation is effected by pressure of the nails. There is now a central hole through the anterior wall of Douglas's pouch. The peritoneum lateral to this hole consists of the undivided remains of the posterior layers of the broad ligaments. The ureter is kept out of the way of the scissors by the first and second fingers of the operator's left hand, and the undivided remains of the posterior layers of the broad ligaments are divided down to the central hole on both sides (Fig. 267).

xx. Exposure of the cardinal ligaments.—The cardinal ligaments are a couple of broad, fanlike, fibro-muscular expansions, one on either side, extending outwards from the vagina. These ligaments anchor the vagina to the lateral pelvic wall and the floor of the pelvis. On their upper and anterior surfaces lie the ureters and those portions of the bladder lateral to the vagina. Their posterior and lower surfaces lie

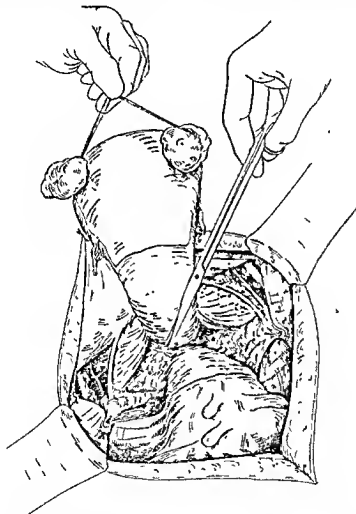


Fig. 269.—Completing the separation of the vagina posteriorly.

against the lateral ligaments of the rectum, separated from them by masses of fibro-fatty tissue. The cardinal ligaments are exposed when the undivided remains of the posterior layer of the broad ligaments are divided, and it is this exposure to which the previous steps of the operation have been working up.

xxi. Beginning the division of the cardinal ligaments.—The uterus is pulled over to one side by an assistant, while a second retracts the

isolated end of the ureter on the other side with a broad retractor. The operator then passes his index finger, as a guide, behind the cardinal ligament, which is then divided with long angular scissors by successive snips. Since the plane of the ligament is a curved one, the greatest care must be taken to keep the rectum clear of the scissors. The ligament should be divided to a point half-way down the vagina, and its fellow on the opposite side should then be treated in a similar manner (Fig. 268). The uterus is next pulled right forwards and the rectum inspected. The fibro-fatty masses of tissue lateral to the rectum should then be cautiously divided, and the rectum in the middle line should be separated down to the pelvic floor, aided by occasional snips of the scissors (Fig. 269).

xxii. Completing the division of the cardinal ligaments.—Not only do these ligaments fix the vagina, so that until they are divided the mobilization necessary before it can be cut sufficiently low down is impossible, but also the main lines of growth infiltration and permeation run outwards in their upper parts, so that the division needs to be made as near the pelvic wall as possible.

The bladder being held back by a flat retractor, its separation from the vagina is completed down to the pelvic floor, while laterally the ureters are freed from the surface of the cardinal ligaments and pressed outwards. The length of the ureter which needs to be entirely separated varies between $1\frac{1}{2}$ and 3 inches, according to how far the growth has extended. As already stated, because of the danger of its necrosing, the length of ureter separated should be as short as possible. The undivided lower parts of the cardinal ligaments are then severed and the vagina is now free, except for its attachment to the pelvic diaphragm.

Hæmostasis.—The cardinal ligaments do not, as a rule, contain blood-vessels of any size, but if there are any bleeding-points, they should be clamped during the course of the division and ligatured afterwards. The method of applying clamps to the cardinal ligaments *before dividing them prevents the operator from dividing the ligaments* as far out as possible. Very often there is no need to ligature any vessels. We have, therefore, for a long time now, abandoned the previous application of clamps.

xxiii. Dividing the vagina.—The uterus and appendages and the vagina, and the cellular tissue in its neighbourhood, are now removed by cutting across the vagina as low down as possible. This is one of the most important steps of the operation, and when it is properly carried out the diseased cervix is removed in a bag of vagina, the vagina being cut across at a part where it is presumably healthy, so that the risk of cell-implantation is absent.

First of all the gauze packing is withdrawn from the vagina, by a nurse, and the lower limit of the growth is defined. A Berkeley-Bonney clamp is next fixed across the vagina, sufficiently clear of the growth

but well above the line at which it is intended to divide the vagina. The exact point will differ; by the technique described practically all the vagina is removed, but in early and favourable cases the operator may decide to remove somewhat less than this.

We have found the Berkeley-Bonney clamp superior in every way to any other pattern we have used. It is easy to apply, it does not slip, and it makes an excellent tractor. When fixing the clamp the

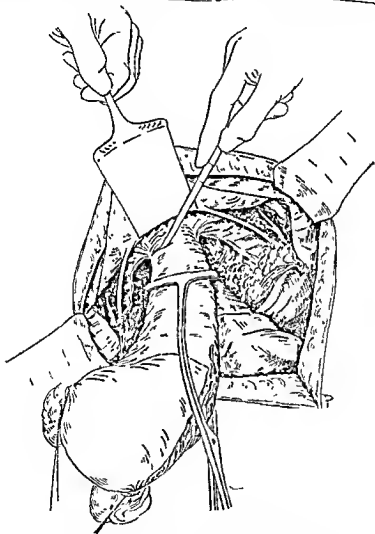


Fig. 270.—Cutting through the vagina.

greatest care must be taken not to include a piece of the rectum, which otherwise may very well happen. The vagina is divided with the scalpel, the bladder and ureters being held carefully out of the way, the anterior wall being divided first, then the two lateral walls, and finally the posterior wall (Fig. 270).

xxiv. Securing blood-vessels.—The operation area is mopped clear, and bleeding-points are ligatured. As a rule there are a few only, and those most likely to give trouble lie about 1 inch lateral to the vagina. The tissue in which these bleeding vessels run should be secured by a mattress-suture on either side. Elsewhere, owing to the depth at which the operator is working, bleeding-points should be under-run with a needle and silk, as direct ligature is difficult. Obvious bleeding-points

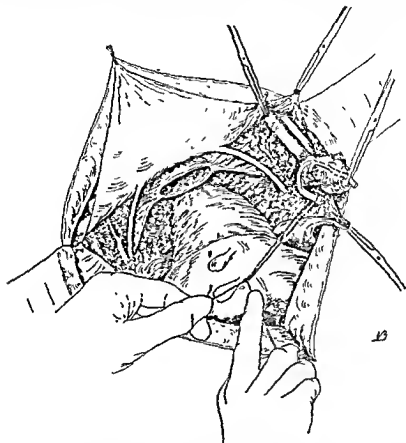


Fig. 271.—Tying the hypogastric artery at its origin from the internal iliac artery and removing the iliac glands.

having been secured, any oozing is arrested by temporarily packing the pelvis with a swab soaked in 1-in-1,000 flavine.

xxv. Removal of the regional glands.—There are two groups of these glands on either side: (1) those lying along the inner side of the iliac veins, and (2) those lying in the obturator fossae. While the iliac glands are easily seen or felt, the obturator glands are more likely to escape detection, since the contents of the obturator fossa are hidden by a screen of tissue; the importance of their removal is very great since they are the first to become permeated with cancer cells.

To remove the iliac glands, the areolar tissue outside the external iliac artery is divided parallel to this artery. The tissue covering the

artery and vein is now stripped from them inwards towards the pelvic brim and should carry with it the glands along the iliac vessels. When the inner edge of the external iliac vein is reached the separation of the areolar tissue is continued down the side wall of the pelvis to the level of the obliterated hypogastric artery. The index finger is now pushed under this artery and the vessel raised up from its origin from the anterior trunk of the internal iliac artery to its disappearance at the corner of the bladder. The artery is then divided at the corner of the bladder

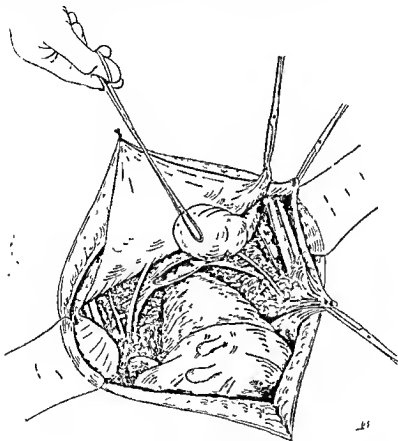


Fig. 272.—Removing the contents of the obturator fossa but the nerve left *in situ*.

and rucked back for its whole length to the internal iliac trunk. A ligature is now placed at its junction with the internal iliac trunk, or on the trunk itself, and the mass is cut away, carrying with it the ligature originally placed on the proximal end of the uterine artery (Fig. 271). When the external iliac glands are obviously malignant, or believed to be malignant, the common iliac glands must also be removed, and occasionally it is necessary to go as high as the aorta. This procedure is followed on both sides.

The obturator glands are removed as follows. The excision of the obliterated hypogastric artery with the accompanying sheet of tissue and glands lays bare the obturator fossa, in which will be lying a mass of yellow fat. The index finger is inserted into the fossa under the external iliac vein. Running through the fat is the obturator nerve, which should be pushed out of the way. By gentle traction and manipulation the mass of fat, together with the obturator glands, is evacuated from the fossa, including a rat-tail-like extension which reaches almost as far as the line of the groin. The fossa is thus left entirely empty down to the bare bone of the pelvic side wall (Fig. 272).

xxvi. Alternative method.—By the technique just described, the regional glands are removed separately from the uterus and vagina. The reason for this is that in a case made difficult by advanced growth, adiposity, and a large uterus, it is easier to get at the pelvic side wall after the uterus and vagina have been removed; and further, that owing to the ureter and blood vessels traversing the fragile tissue between the cervix and the glands, it is sometimes impossible to perform an excision *en masse*.

Some surgeons, however, employ the technique described under pelvic exenteration (*see p. 410*), in which the glands and cellular tissues are stripped off the pelvic side wall at an early stage in the operation.

The drawback to this is that if bleeding starts on the side wall, the space available to work it may be so narrow that the satisfactory application of forceps is difficult. This drawback, of course, does not exist in the operation of exenteration.

xxvii. Treating the extirpation cavity.—If the vagina has been removed to the extent described, it is almost impossible to suture its open cut end. We used to pack the pelvis with 2 feet of gauze soaked in 1-in-1,000 flavine, the lower end of which was pushed through to the vulva and removed in 50 hours by pulling on this end. We have, however, given this up, unless there is persistent oozing from the walls of the extirpation-cavity, for it is painful to remove and in one case the bladder was torn during the removal. Instead we leave the cavity empty, with the remains of the vagina open for drainage.

xxviii. Suturing the pelvic peritoneum.—The anterior peritoneal flap, which up to now has remained sutured to the anterior abdominal wall, is liberated, and by means of a continuous catgut suture, starting at the point where the left ovario-pelvic ligament was ligatured, is attached to the peritoneum covering the posterior half of the pelvis and the bowel, the suture line ending at a corresponding point on the right side (Fig. 273). In this manner the peritoneum covering the bladder is sutured to that on the anterior face of the rectum and on each side of it, and eventually the floor of the pelvis is covered over and the raw-surfaced extirpation cavity disappears from view.

Care must be taken not to prick the ureters or iliac vessels, both of which lie uncovered in close relation to the peritoneal edges along which the suture is carried, or, if the cavity has been packed with gauze, not to pick it up with the needle.

xxix. Closing the abdominal cavity.—See p. 286.

Difficulties and dangers. i. Separation of the bladder.—The ease with which the bladder can be separated depends entirely on the extent

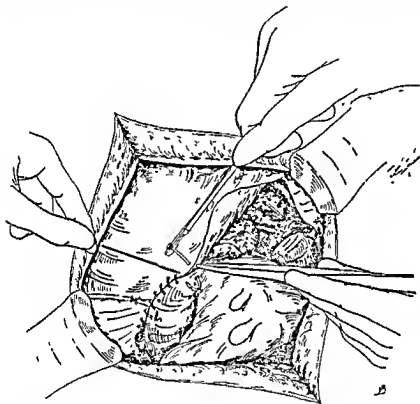


Fig. 273.—Suturing the peritoneum across the pelvis.

of the growth. In an early case the bladder strips quite easily, the fibres of the vagina at once come into view, and the separation is carried down till the upper 2 inches of the anterior vaginal wall are exposed. If, however, the growth is extensive, very great difficulty may be experienced in separating the bladder, in which case it is better to commence the separation at the sides, proceeding towards the mid-line. Unless the greatest care be taken, the bladder is very likely to be injured. The risk is all the greater if the bladder itself is found to be infiltrated; in that case, indeed, it becomes a question whether the operation should be persevered with or whether partial exenteration should be performed. (See p. 906.)

If the bladder be wounded, it should be at once sutured. If the

wound remain undiscovered, or after suture does not heal, a fistula results, as it may after the bladder has been opened deliberately and a piece of it resected. Vesico-vaginal fistulae may also be due to necrosis of the bladder-wall from sepsis and sloughing, promoted by its diminished blood-supply owing to ligature of the vesical arteries or denudation of its wall when separating it from the vagina.

If the bladder has been accidentally injured, or a piece of it purposely resected, it is often a very difficult and lengthy procedure to suture the opening properly, situated as it generally is at the junction of the posterior wall and trigone. Sepsis, too, frequently occurs in this situation, and after operation the sutures are less likely to hold.

During the separation of the bladder there may be troublesome bleeding from the anterior vaginal vessels. These, if possible, should be secured with forceps and tied, or, failing this, the oozing must be temporarily arrested by pressure with a swab.

ii. *Injury to the ureter.*—From what has been said, it will be apparent that the chief danger of the operation is injury to the ureter. It runs the risk of injury—

- (1) When the ovario-pelvic ligament is being tied and divided.
- (2) When the uterine vessels are being tied and divided.
- (3) When its cervical portion is being isolated.
- (4) When it is double.
- (5) When the vaginal clamp is being applied.
- (6) When the pelvic peritoneum is being sutured.

The injury may consist in dividing it, including it in a ligature or suture, damaging the peri-ureteral plexus of vessels (stripping it too clean), or crushing it with forceps.

Absolute isolation of the terminal 2 inches of the ureters is a necessity if a thoroughly radical operation is to be performed in a case in which the growth is advanced. Some surgeons content themselves with merely exposing the ureters or separating their last inch, and in early, easy cases a fair extirpation of the growth may be achieved by such means, but it is impossible to deal with advanced cases in this way with any hope of success.

On the other hand, no more of the ureter should be isolated than is necessary for free access to the cardinal ligaments and upper surfaces of the levatores ani.

The danger of isolation is necrosis during the first week succeeding the operation. The risk of this is minimized by not stripping the ureters so close as to damage the peri-ureteral vessels, and by handling the ureters with the greatest gentleness.

If a ureter be divided, it is necessary to determine which is the best treatment. The divided ends can be united by suture, but this procedure is difficult and it is best if possible to implant the renal end into the

bladder. An alternative is to implant it into the colon, and this should certainly be done if both ureters have been divided.

If the accident is not discovered or the ureter necroses after it has been implanted or sutured, the urine will escape into what remains of the vagina, and if the patient lives, a distressing fistula will appear, usually from five to ten days after the operation. Pyelitis of more or less degree is generally present. Later on the fistula can be cured by implanting or reimplanting the ureter into the bladder, or implanting it into the colon. Sometimes, as the result of the pyelitis, the kidney becomes disorganised, in which event it must be removed. In the latter event, care must be taken not to remove the wrong kidney.

These accidents are more likely to happen when the growth is an extensive one and when infiltration has taken place into the cardinal ligaments, so that the mass forms a great buttress on each side. When the ureter is surrounded by much infiltration, as indicated by its obvious dilatation, it can be dissected out only with the greatest difficulty, and the involved portion should be resected and the upper end implanted in the bladder. Sometimes, owing to the ureter apparently lying at a much lower level than usual, great difficulty will be experienced in detecting it as it winds round the cervix, in which case its dissection will have to be commenced much farther back, perhaps even near the ovarian ligature, so that when it is free its whole pelvic portion hangs loose like a clothes-line across the pelvis. This method of dealing with the ureter is to be particularly avoided if possible, because of the injury to its blood supply, which is largely derived from the vessels of the peritoneum to which it is adherent. The uterine artery may be found running parallel with the course of the ureter and above it; this distribution is abnormal, and the vessel may be mistaken at first for the ureter.

When the posterior layer of peritoneum in the neighbourhood of the ovarian vessels is pulled up to pass the first stitch of the continuous suture, the ureter may be pulled up with it, and care must be taken not to include it.

Lastly, the ureter may be double and, this escaping notice, when one ureter has been isolated, the other is ligatured and cut under the impression that it is a vessel.

iii. Clamping and dividing the vagina.—Great care must be taken when applying the clamp not to include the ureter or any portion of the bladder or rectum in its grip. The danger of discharge soiling the peritoneum is overcome in the vagina by the vaginal pack.

Great care must be taken also, when dividing the vagina, not to injure the ureters, bladder, or rectum. The rectum is particularly in danger as it is out of sight, and its injury is nearly always fatal.

iv. Arrest of hæmorrhage.—In the course of the operation it may be necessary at frequent intervals to arrest oozing, or even brisk

hæmorrhage, by means of pressure forceps or ligature. There are occasional cases in which diffuse oozing occurs throughout the operation to an extent which gravely jeopardizes the patient. If the bleeding vessel is plainly seen, it should be picked up with the forceps and ligatured, but much trouble may be experienced from venous oozing due to the wounding of the plexus of veins in the base of the broad ligament. The bleeding is at times so free that the pelvis rapidly fills up with blood. The excess of blood must be removed quickly with swabs, a clean swab is pressed down on the bleeding area by an assistant, and then at a given signal he removes the swab and the operator clamps the bleeding spot. By far the best instruments to use for this purpose are ring forceps (Fig. 3, p. 8), which secure a good grip of the tissue, while their oval ends enable a ligature to be applied over them with ease, even in a deep cavity. With the ureters isolated and in view, no fear need be felt in applying the forceps, as there are no structures of vital importance which can be injured. If the bleeding is not very brisk, and its source is difficult to locate, pressure with a swab will at times check it.

For diffuse oozing as distinguished from bleeding points, the styptic gelatine sponge or sheet, now produced by several manufacturers, is very efficacious.

Troublesome bleeding is most often due to division of veins when the uterine artery is being isolated. In the operation as described this procedure is carried out at an early stage, and sometimes it may not be possible efficiently to control the oozing until a much later stage in the operation. In weak and debilitated patients every drop of blood is of value and it is useful, after the bladder has been proved separable, to modify the order of procedure and to separate the rectum before seeking the uterine artery and ureter.

During the dissection of the cellular tissue and removal of the uterus the large iliac vessels will be in view, and injury to them must be avoided.

There is usually a certain amount of free hæmorrhage from the cut vaginal walls. This can be stopped by running a suture along the cut edge. More troublesome may be the bleeding from the lateral vaginal vessels, which lie outside each lateral angle, but this can be arrested by mattress-sutures.

A serious source of hæmorrhage is the large plexus of veins which are converging to form the internal iliac vein. The position of the plexus is parallel with, but about 1 inch below, the line of the obliterated hypogastric artery. This area should always be avoided, unless the extent of the growth compels the operator to trespass upon it. The bleeding may be very free, and much valuable time may be wasted in checking it. The operator should seize the bleeding-point with ring forceps and then pass two ligatures above and below the forceps by means of Worrall's needle. The point of the needle must keep close

to the bone, though there is a danger of including one of the units of the sacral plexus.

The most serious source of hæmorrhage is a tear in the internal iliac vein, or occasionally the external iliac vein, or even the common iliac vein, during the removal of the regional glands. This hæmorrhage, which is very alarming, must be temporarily arrested by the firm pressure of a swab. Then, at a moment indicated by the operator, the assistant removes the swab, or the operator does so himself, and the wound in the vein is grasped and a lateral ligature is applied. If this lateral ligature can be applied the result is generally satisfactory, but if the external iliac vein and still more the common iliac vein has to be ligatured in its entirety the result may be disastrous, especially if the wounded vein is the common iliac. In one of our cases such a complication led to amputation of the leg at a later date. If a lateral ligature cannot be applied it will be necessary to leave forceps on the vein and bring their handles out through the abdominal wound. This is a very serious thing to have to do.

v. *Fistulæ*.—The subject of injury to the bladder and ureter has already been discussed. Most of the fistulæ arising therefrom declare themselves between the 5th and 10th days of convalescence, and are the result of sloughing due to a combination of insufficient blood supply and infection. They are serious complications, not only on account of the disability they will cause in the future, but because of the immediate sepsis which accompanies them.

With a vesical fistula, severe cystitis is almost invariably present; with a ureteric fistula, more or less suppuration of the operation area, and often pyelitis.

Frequent irrigation of the vagina is necessary, and with cystitis, irrigation of the bladder also is required. Penicillin and the sulphonamides are the first drugs to be used and in prolonged cases, urotropin gr. 10, and acid sodium phosphate gr. 30, should be given three times a day.

The outlook is unfavourable, particularly in the case of a vesical leak, which scarcely ever closes spontaneously, though a hole in the ureter may heal of itself, even after the lapse of more than a year.

An operation for the closure of these fistulæ cannot be undertaken until the rest of the operation area is entirely healed and all trace of sepsis has departed. In the case of the bladder, the urine should be clear before an operation is attempted, and, for preference, this should be so in the case of the ureter. In these latter patients, however, a chronic pyelitis, the remains of the acute pyelitis which so often complicates a ureteric fistula at its beginning, is very frequently present so long as the ureteric leak remains. The operation for the closure of the vesical fistula may be easy if it is small, but very difficult or impossible if it is large. In the latter case, uretero-colic anastomosis is the only resort (*see p. 165*).

The operation for ureteral fistula is also difficult. In all the cases we have operated upon, the leak was situated about 1 inch from the bladder, and the ureter above this point was dilated, while its lower end was embedded in dense scar tissue. By loosening the bladder we were able satisfactorily to graft the ureter (*see p. 777*).

In the case of a leak higher than this, such implantation would probably be impossible, in which event the ureter should be implanted into the colon; but when, as the result of the fistula the kidney is disorganized, that organ must be removed.

It is not always easy to decide whether a fistula belongs to the right or the left ureter for, though the cystoscope be used, it may be impossible to pass the ureteric catheter more than an inch up either ureter, on account of the altered course and fixity which often follow the extensive alteration in anatomical relations effected by the operation. Even the orifices themselves may be very difficult to find. Pyelography generally gives great help but even this sometimes fails. In such a case the patient should be given a hypodermic dose of methylene-blue, so that the observer may see from which side the urine is entering the bladder. If any doubt remain, and it be deemed expedient to remove the kidney, the point can be decided by injecting into the kidney with a hypodermic syringe, after it is exposed in the loin wound, a solution of methylene-blue, having previously placed a white wool swab in the top of the vagina. After waiting 10 minutes the swab is withdrawn and the bladder is catheterized. If the swab is coloured blue and the urine is untinted, the kidney into which the dye has been injected is that with which the fistula is connected.

Recto-vaginal fistulæ are much less common, for injury to the bowel is generally fatal. During their establishment there is always much suppuration and constitutional disturbance. As a rule, if the patient survives, they close spontaneously, and time should be given them. A few cases will require a plastic operation after all signs of sepsis have passed away.

vi. Removal of the regional glands.—Great care should be taken when raising the obturator tissue off the pelvic floor not to injure the large vein which runs forwards parallel with and just outside the edge of the sacrum. This vein is directly continuous with the internal iliac vein, and, if wounded, bleeds furiously. Also, in stripping the obturator tissue back off the wall of the fossa, the obturator vein should be looked for and clamped and divided separately, if seen, for both this and the internal iliac trunk are difficult to secure if accidentally torn.

Carcinomatous glands are often found adherent to the external iliac vein, in which case great care must be taken when removing them. If the vein is torn, it will have to be ligatured, laterally if possible. If care be taken and the gland removed deliberately and slowly, it is often possible to ablate a gland the removal of which would seem to

he impossible; in such circumstances we have removed glands as large as unshelled walnuts. The chief point is to ascertain the plane of separation between the vessels and the gland and to separate the mass by pressure on it and not on the vessels. It is sometimes possible when this cannot be done from above downwards, to finish the separation from below upwards.

Dressing and after-treatment.—The general lines of after-treatment are indicated at p. 24 and in Chapter XXX. Paresis of the bladder invariably follows this operation, and regular catheterization is a necessity for some week or two afterwards. The catheter should be passed once in the first 24 hours, twice in the second day, and thereafter every 8 hours. At the end of a week the patient should try to pass water herself, and, if she succeeds, the amount should be measured and then the catheter passed to ascertain the amount of residual urine; this procedure should be continued until the residuum is less than 4 ozs. when catheterization may be given up. The power of micturition always returns. Sulphathiazol given for some days after the operation will prevent pyelitis or greatly mitigate it.

Post-operative complications.—There are certain complications so frequently following this operation that they require a separate discussion.

1. **Shock.**—Some patients are considerably shocked by the time they leave the table, and in a few the shock is profound. A much larger number of patients develop symptoms of shock an hour or more after the operation, as the effect of the ether wears off. The shock is due to the time occupied by the operation, the free loss of blood, and the extensive disturbance of the parts. Further, in many cases the patient's health is already undermined by pain, hæmorrhage, and septic discharge, in addition to which many of the women are over 50 years of age. The operation should take about 75 minutes. The operator should, however, have at his command sufficient dexterity to shorten this time very materially if in any particular case it is desirable. There is a striking variation in the difficulty of the operation in different cases, a factor which is beyond the control of the operator. The difficulties become enormously enhanced when the patients are fat, or when there is extensive infiltration of the cellular tissue or adhesion to the bladder. We have found that cases presenting extensive infiltration and cancerous hypertrophy of the cervix without ulceration are very much more arduous to deal with than those exhibiting excavation or fungosis. In particular, the surgeon should try to avoid injury to the bladder, rectum or ureter, for the extra time taken to suture the rent is a great handicap to the patient. In many advanced cases a condition of adhesive salpingitis is present which delays the operation and makes the exposure of the ureters more difficult. The amount of oozing from the extensive raw surface left after the extirpation varies greatly. In some cases,

particularly in early ones, it is comparatively slight, but when the growth is extensive it may be considerable, and time is unavoidably lost in arresting it.

The traumatic component of the general operative shock can be greatly minimized by combining spinal with general anæsthesia, but it must be admitted that in these cases it is the loss of blood much more than the tissue damage that is so harmful to the patient.

Even with the greatest care the operator can exercise, a very considerable amount of blood is always lost, most of it from a continual oozing which it is impossible to control. The operator should secure every vessel that is bleeding, even at the commencement of the operation, since it may truly be said that every drop of blood is of value.

Some operators have, as a routine, ligatured both internal iliac arteries as a preliminary to the operation. We only do so in certain advanced or difficult cases where infiltration of the cardinal ligament makes finding the uterine artery in the usual way difficult. Ligature of the internal iliac arteries does not control hæmorrhage during the operation in the way that might be expected. This is due to the facts that the pelvic anastomoses are very free, and that the most troublesome bleeding is from the veins. As already stated, a canula connected with receptacles containing blood and glucose saline should be inserted into one of the arm veins before the actual operation begins. It is usual to begin with a very slow drip so soon as the operation is started, and increase it according to the patient's condition. The transfusion should be continued when the patient is returned to the ward for as many hours or days as may seem necessary.

Rectal saline infusion should be avoided because the bowel has been considerably bared and loosened.

An electrically-heated cradle, if possible, should be employed during the period of shock, and coramine is the best stimulant.

ii. *Septic infection of the operation area.*—Were it possible absolutely to sterilize beforehand the growth and the genital canal, at least two out of every four deaths due to the operation would be avoided. Unfortunately, this at present is not possible, though Violet-green has gone a long way towards it.

With a stinking growth of the fungating variety, local removal ten days or a fortnight beforehand is excellent, and a relatively innocuous surface may be obtained before the major operation.

With a stinking excavation, however, the case is different. In such cases we have abandoned cauterization and curettage carried out some days beforehand; neither of these procedures improves the discharge, and both, by thinning the cervix, increase the likelihood of its tearing during the operation. Of recent years radium has been used to clean up these bad cases, and with success in many instances. It should be applied by Stockholm plaques a fortnight before the operation.

In all cases in which the uterus appears enlarged, a sound should be passed to tap a pyometra if it be present. This complication is a serious one, for besides rendering the operation more difficult by enlarging the uterus, the thinned uterine wall may give way and the peritoneum become infected, or during the manipulations the pus may be squeezed into the vagina, with the same result when it is cut across.

In cases in which the growth is not breaking down and the patients are free from offensive vaginal discharge, the risk of serious septic infection of the operation area should be slight. A certain amount of infection of the extensive raw surface that is left in the pelvis is perhaps inevitable, and most cases manifest some fever accompanied by a vaginal discharge during the 2nd week of convalescence. When the cervix is extensively ulcerated, or when a fungating and stinking mass fills the vaginal vault, the probability of serious infection of the operation area becomes much enhanced. In these cases signs of marked septic infection of the operation area usually begin about the 5th day with considerable fever, and a foul discharge, lasting perhaps for several weeks.

The case must be treated by penicillin or one of the other antibiotics and the sulphonamides.

iii. **Septic infection of the bladder.**—As will be seen on reference to p. 400, for a week or two the patients are unable to empty the bladder completely, and this is sufficient, in itself, to account for the tendency to cystitis. This tendency is increased by the extensive denudation of the outer wall of the bladder in the region where it has been separated from the supravaginal cervix, vagina, and tissues lateral to them, and by the injury done to the bladder-wall from its diminished blood supply and from damage to its nerves. In regard to this, we have pointed out that the area of bladder attachment to the cervix, normally about $\frac{1}{4}$ inch, becomes greatly elongated owing to the enlargement of the cervix produced by the carcinoma. In addition, this outer raw area of the bladder-wall directly bounds the large subperitoneal cavity left by the operation, a cavity that probably in all cases subsequently becomes more or less infected. The appearance of pus in the urine in these circumstances is not surprising, and as a fact it is very rare for a patient to maintain a clear urine throughout convalescence. Post-operative cystitis and pyelonephritis are indeed the most common later complications of the operation.

Until the bladder has begun to recover its power, the catheter will need passing 3 times a day. Even after the patient has begun to evacuate her urine, the catheter will still be needed to deal with the residual urine while the patient is able only partially to empty her bladder. It follows that the catheterization period is likely to extend in all cases as long as 2 weeks and, on occasions, longer. Throughout this period it is our practice to give one of the sulphonamides (sulphathiazol) every 8 hours, as a prophylactic against infection, and to wash

the bladder out with boric acid once a day. If this routine be carried out, cystitis will not occur, or will be of short duration. Occasionally part of the bladder sloughs, with hæmaturia and signs of toxic absorption. This is nearly always fatal.

iv. Septic infection of the abdominal wound.—In some cases the abdominal wound fails to heal by primary intention. There may be a stitch-abscess, a little local suppuration, or sloughing of the whole wound. This latter is a grave complication. We have noted that it has always occurred in those cases in which the odour of the primary growth was markedly offensive. It is due to infection of the tissues by anaerobic organisms from the site of the primary growth, their power of resistance having already been lowered by the bruising caused by prolonged retraction of the wound-edges. The muscular tissue is particularly affected, and the slough has the same odour and appearance as the sloughing carcinoma. It bears a very close relation to—if indeed it is not the same thing as—gas-gangrene occurring in war-wounds.

The appearances are at first deceptive, the skin seeming to be healthy and the wound united. About the 4th day, however, a brownish offensive discharge is noticed, coming from the lower end of the wound, and on separating the edges, the fat, cellular tissue, and fascial and muscle edges are found in a condition of sphacelus. The patient is always more or less toxic during the acme of the process.

The prevention of wound-infection is, therefore, an important matter. It is to be effected :

1. By procuring as complete a cleansing of the cervix and vagina as the case will admit.
2. By shortening the operation as much as possible, and so saving the wound-edges from needless exposure and manipulation.
3. By covering the edges of the abdominal wound with two layers of sterile sheet rubber in the manner previously described (p. 279). Less manipulation of the wound-edges is required if a mechanical retractor be used (pp. 11 and 282).
4. The prevention of sepsis has been rendered much more successful by the use of penicillin and the sulphonamides. In cases in which sepsis appears likely, the former may be given directly after the operation, but in others its use can be postponed until symptoms of infection show themselves. At the close of the operation, penicillin and sulphonamide powder can be dusted over the raw tissues as described on p. 29.

The presence of wound-sepsis should be looked for on the 5th day, when the Michel's clips are removed, and, if there is any suggestive oozing from the lower end of the wound, the skin-edges there should be immediately separated and the condition of the deeper parts investigated. Sloughing or suppuration having been found, the whole length of the skin incision should be opened up and dressings soaked with peroxide

of hydrogen solution (10 volumes) freely applied. This measure, the administration of anti-gas-gangrene serum, and the free access of air to the affected part generally cause the condition rapidly to improve, and in 48 hours the wound may look quite clean. It will, however, take many weeks to heal entirely, and, as a weak scar is certain to result, the patient must be fitted with an abdominal belt.

Sepsis less virulent than this should be treated with penicillin and, or, one of the sulphonamides, and the skin wound must be sufficiently opened up to allow the pus to escape—warm fomentations to the infected area are helpful and comforting.

v. Diarrhœa.—This is due to septic infection of the operation area. It is a serious complication. Starch and opium enemata may be tried, but the diarrhœa will continue while the proctitis causing it remains.

SYNCHRONOUS COMBINED ABDOMINO-VAGINAL HYSTERECTOMY*

John Howkins has recently introduced this operation, which may be described as a combination of Wertheim's hysterectomy and the operation of radical hysterovaginectomy, described on p. 265. Two expert surgeons, each with his own team of assistants are required, and the operating table must be fitted with the special leg-rests used in synchronous combined excision of the rectum (see p. 776).

The abdominal surgeon follows the technique of Wertheim's operation as just described, while the surgeon at work on the vagina separates the lower inch of that canal from its surroundings, and then packs it with gauze soaked in violet-green, after which he rapidly separates it from the rectum behind and the bladder in front. The attachments to the levatores ani are then divided, and afterwards the lower part of the cardinal ligaments.

By this time the fingers of the two surgeons should have met in front of the vagina, but it is noteworthy that there are two planes of cleavage between the base of the bladder and wall of the vagina, the more superficial being situated between the vaginal wall and the pubo-cervical musculo-fascia, and the deeper one between that fascia and the bladder wall. There is a tendency, when working from below, to follow the superficial plane, whilst if working from above the deeper plane is entered on. Thus, the fingers of the two operators may not exactly meet, but if they do not, a small cut with the scissors allows them to do so.

By this time, the ureters have been traced down to the bladder and their lower two inches freed. The mass to be removed is usually taken out from below (unless the uterus has fibroids in it), and the surgeon at the lower end having arrested all bleeding from the tissues from which

* John Howkins, *Lancet*, April 21, 1951, p. 872.

the vagina has been separated, lightly packs the cavity with flavine gauze; while in the meantime the abdominal surgeon has completed the suture of the peritoneal floor.

It is claimed for the operation that it can be completed quicker than the classical one, and that the routine removal of the whole of the vagina should diminish the recurrence rate.

CHAPTER XVII

PELVIC EXENTERATION

THE great advancement which has taken place of recent years in the adjuncts to a surgical operation, better methods of anæsthetization, continuous transfusion and infusion, and so forth, have rendered possible the successful performance of operations which, not so very long ago, would have resulted in certain death.

Amongst these is the operation of pelvic exenteration introduced by A. Brunschwig of New York, in order to cope with cases of carcinoma of the pelvis advanced beyond the scope of the usual operations. The operation has its chief application to cases of carcinoma of the cervix and vagina, outside the range of Wertheim's operation, by reason of the extension of the growths in spite of radiological treatment, but it can be employed in certain cases of carcinoma of the corpus uteri, the bladder and the rectum.

It is, however, with its application to cases of cervical or vaginal carcinoma that this chapter is concerned.

The operation has been taken up in this country by a number of enterprising surgeons, but it has not been performed long enough or often enough to allow a final decision of its value to be made.

It is certain, however, that patients recovering from the operation may be back at their work and without signs of recurrence one to two years after their ordeal, a remarkable fact when it is remembered that unoperated upon their speedy death was certain. The operative mortality is, of course, a high one. Brunschwig, for all cases of exenteration, reports his as 22 per cent., which, however, is a figure better than Wertheim's 30 per cent. in his first 100 Wertheim operations. With increasing experience in the performance of the operation, and particularly if, instead of operating on every case regardless of the patient's condition, as Brunschwig has done, some selection is exercised, this operative mortality is certain to be reduced, but a procedure of such magnitude applied to such desperate cases must always carry a considerable risk.

Partial and complete exenteration.—There are two degrees of pelvic exenteration, *partial* where the bladder is removed with the genital organs, and *complete* where all the pelvic contents including the rectum are removed. In its gynaecological application the *partial* operation is the most important, because it enables the surgeon to deal with those cases of carcinoma of the cervix or vagina in which the bladder is

involved, and which for that reason are outside the range of Wertheim's operation.

Two-way or one-way approach.—The operation Brunschwig performs begins abdominally and is completed from below, the object being to remove the entire genital and vesical tracts including the vaginal and urethral orifices and the vulva. In cases in which these parts are involved by, or in close proximity to the growth, this is necessary.

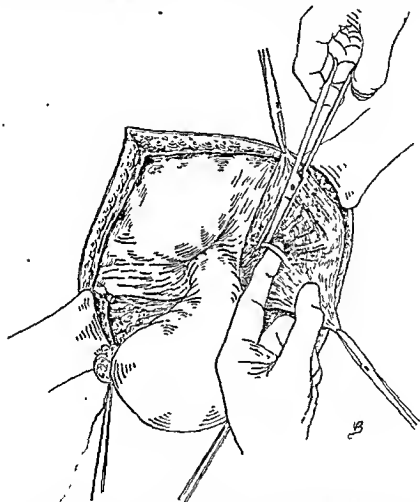


Fig. 274.—Partial pelvic exenteration. Dividing the right ureter.

On the other hand, in most cases of advanced cervical carcinoma, the growth has not reached down so far, or nearly so far, and in view of the fact that the second or vulval phase of the two-way operation very definitely increases the operative shock, and that complete removal of the bladder and vagina can be achieved through an abdominal incision alone, we think it better to reserve the two-way operation for those cases in which it is absolutely necessary to perform it. Many years ago I showed that the entire length of the vagina could be removed by

Wertheim's operation, and advocated that step in all cases of advanced cervical growth.

The following text and illustrations deal with the one-way abdominal operation only.

PARTIAL EXENTERATION

Preparation of the patient before operation.—As for Wertheim's operation (*see* p. 373). To restrain the intestinal bacteria 5.5 to 7 grammes of phthalylsulphathiozol should be given daily by the mouth for 3 or 4 days prior to the operation.

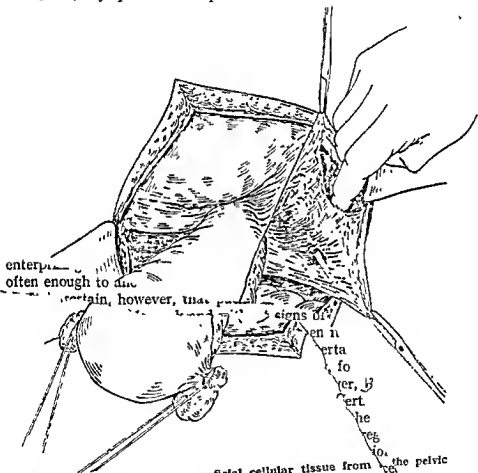


Fig. 275.—Separating the superficial cellular tissue from the pelvic side wall.

Instruments.—Those for Wertheim's operation—*see* p. 373—and an aneurysm forceps and intestinal needles.

Operation.—i. *Ansæsthesia.*—As for Wertheim's operation.
 ii. *Catheterization and packing the vagina.*—The catheter having been passed, the vagina is packed in the manner described under Wertheim's operation (*see* p. 374) and the patient is then placed in the Trendelenburg position.

- iii. Opening the abdominal cavity.—As in Wertheim's operation (see p. 274).
- iv. Packing off the intestines.—See p. 282.
- v Preliminary inspection —See p. 376.
- vi Ligating the ovario-pelvic and round ligaments.—As in Wertheim's operation (see pp. 376-377).
- vii. Division of the broad ligaments and ligature of the uterine cornua.—As in Wertheim's operation (see p. 377).

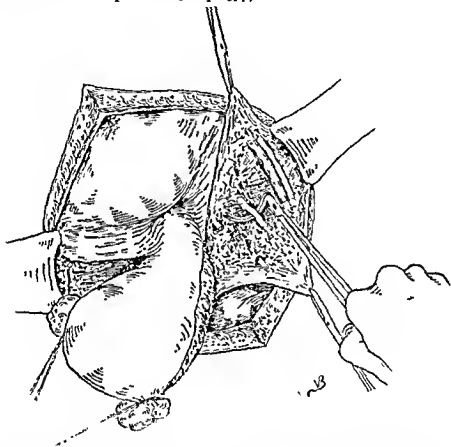


Fig. 276.—Passing the aneurysm forceps under the right iliac artery prior to ligation.

Up to this point the technique of Wertheim's operation has been followed, but now comes a deviation because the bladder is adherent to the cervix and cannot be separated.

viii. Enlarging the opening in the broad ligaments and identification of the ureters.—This is carried out as in Wertheim's operation (see p. 380).

ix.—Exposing the ureters and dividing them.—The ureters, having been exposed by blunt dissection, are followed down until they disappear in the ureteric canals. They are then divided well clear of any induration indicating growth. In cases where the bladder is involved, one or both ureters will probably be found to be dilated (Fig. 274).

x. Separating the cellular tissue from off the great vessels.—The thin sheet of cellular tissue which covers the external and internal iliac vessels is now pushed off them by the fingers, carrying with it the glands along the inner side of the external iliac vein. This displacement inwards is continued until all the vessels are plainly visible (Fig. 275).

xi. Ligature of the internal iliac artery.—An aneurysm forceps or needle is passed under the vessel, avoiding injury to the internal iliac vein, and the ligature, after being drawn through, is tied (Fig. 276).

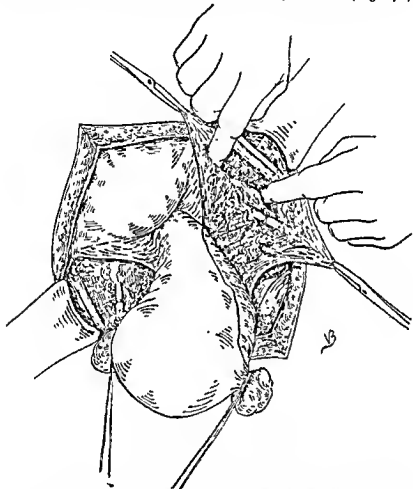


Fig. 277.—Separating the deep cellular tissue and obturator glands from the pelvic side wall.

xii. Separating the deep cellular tissue and the contents of the obturator fossa.—Starting at the brim of the pelvis just below the external iliac vein, the fingers, keeping close to the side wall of the pelvis, push inwards the soft tissue clothing it together with the contents of the obturator fossa and the obturator glands. The obturator-nerve runs through this tissue and should be disengaged unless induration proclaims the growth to have extended thus far, in which case the nerve must be cut and removed (Fig. 277).

xiii. Separating the bladder from the front wall of the pelvis.—The foregoing manœuvres having been carried out on each side, the surgeon now turns to the front of the pelvis, and by finger pressure aided by scissors, separates the front wall of the bladder from the bone until the urethra comes into view (Fig. 278).

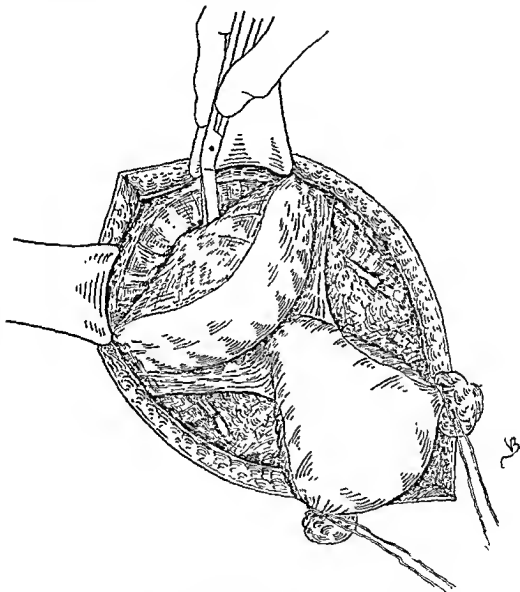


Fig. 278.—Separating the bladder from the front wall of the pelvis.

xiv. Dividing the lateral attachments of the bladder.—To do this safely, the surgeon must first see that the external iliac vein is freely exposed down almost to the line of the groin, for otherwise there is a risk of wounding it. The lateral ligaments of the bladder should be divided by scissors, having first divided the piece of peritoneum which

still passes from the bladder on to the abdominal wall. By working downwards until the floor of the pelvis is reached, and then working inwards on the face of the cardinal ligament, the whole of that side of

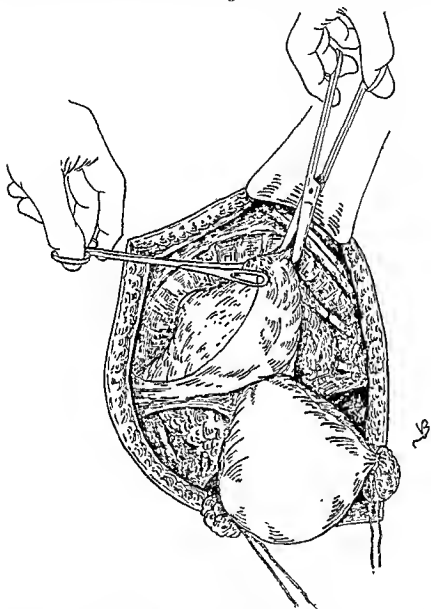


Fig. 279.—Dividing the lateral vesical ligament and other lateral attachments on the right side.

the bladder is made free. The same proceeding is then carried out on the opposite side (Fig. 279).

xv. Separating the rectum from the vagina.—The peritoneum at the bottom of Douglas's Pouch having been divided, the fingers separate the vagina from the rectum as described in Wertheim's operation on

p. 386. The separation is made easier by the packing which fills the vagina.

xvi. Dividing the cardinal ligaments.—This step is carried out exactly as in Wertheim's operation (*see pp. 388–389*). As the entire vagina is to be removed, the ligaments must be divided their whole depth, *i.e.*, down to the pelvic floor. When the last fibres are divided, the pulled-upon vagina suddenly rides upwards as though a string holding it had been severed (*Fig. 280*).

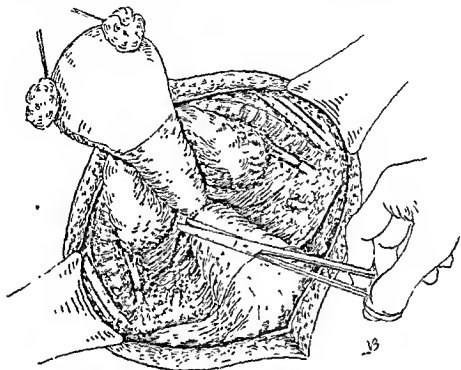


Fig. 280.—Dividing the lowest part of the left cardinal ligament.

xvii. Dividing the urethra and vagina.—The vaginal packing having been taken out, the whole mass to be removed is gathered up in the surgeon's left hand and pulled upon strongly, while, with a scalpel he first divides the urethra and after it the vagina. He thus removes, in one piece, the entire vagina, the bladder, the uterus and appendages, the pelvic cellular tissue in relation to them, and the external iliac and obturator glands. The muscles of the pelvic floor, perforated by the terminations of the urethra and vagina, are seen exposed at the bottom of the pelvic cavity (*Fig. 281*).

xviii. Grafting the ureters into the colon.—The ureters are now grafted into the colon. The technique is that described on pp. 165–168, but some surgeons have modified it by leaving the ends of the ureters

as they were cut and not pointing them. Both ureters are, of course, implanted at the same time.

xix. Packing the pelvic cavity with gauze.—It is impossible to peritonize the extirpation area, so the operation is completed by lightly packing

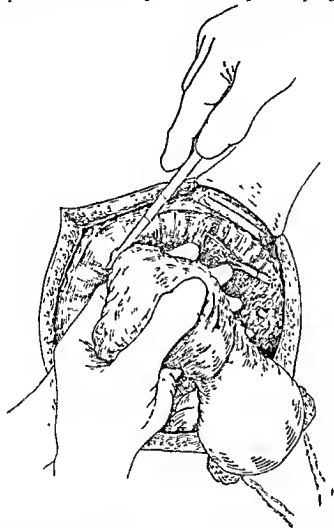


Fig. 281.—Dividing the urethra prior to cutting across the vagina.

the pelvis with flavine gauze, one end of which is passed through the vaginal orifice, while a rubber tube is fixed through the anus. It might be thought that so extensive a raw area would cause extensive intestinal adhesions, and so give rise to symptoms of obstruction, but this does not seem to happen (Fig. 282).

xx. Closing the abdominal cavity.—See p. 286.

Difficulties and dangers.—The operation should not be undertaken by a surgeon unacquainted with the technique of Wertheim's operation, of which it may be regarded as an extension. The difficulty

of Wertheim's operation lies rather with what the surgeon has to conserve rather than with what he has to remove. In pelvic exenteration, he is under no such handicap, and for this reason it is the easier of the two operations. The preliminary ligation of the internal iliac arteries removes, to a large extent, the danger of severe hæmorrhage, and it may be wondered why, if such is the case, the arteries are not ligated as a routine in Wertheim's operation, instead of under exceptional circumstances, only. The reason is that this step is sometimes followed by

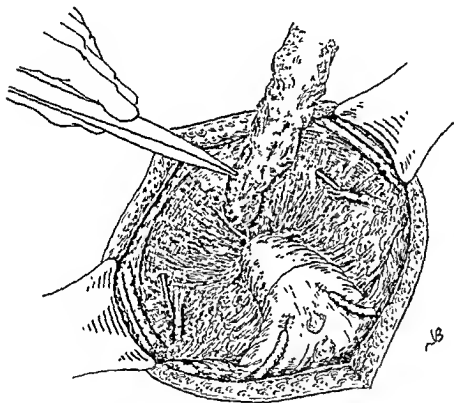


Fig. 282.—Packing gauze through the vaginal orifice. The ureters have been grafted into the colon.

necrosis of the mucosa of the bladder, whereas when the bladder is removed, this danger does not exist.

The greatest risk of the operation is from shock, and this is countered by continuous transfusion of blood throughout the operation, and for as long afterwards as may be deemed necessary, changing afterwards to saline glucose infusion.

Besides shock, death may be due to peritonitis, or pyelonephritis, or secondary hæmorrhage. To prevent the two former, penicillin and

streptomycin and the sulphonamides are employed, and if there is distension and vomiting gastric suction is indicated.

Dressing and after treatment.—The general lines of after treatment are those described on p. 24 and in Chapter xxx. The tube in the anus is connected with a receptacle. The gauze in the pelvis is withdrawn at the end of 3 or 4 days. As regards the bowels, a glycerin enema is given on the 3rd day when the anal tube is removed, and penicillin and sulphathiazol are given for the first 5 days. The bowel opens frequently at first, every 2 hours to begin with, as a rule, but later it becomes accustomed to the urine and empties itself at longer intervals.

COMPLETE EXENTERATION OR PELVIC VISCERECTOMY

This operation is indicated in cases in which a growth starting in the cervix or vagina has involved the rectum, and in those less common instances where a secondary growth in the ovary has involved the lower colon, and also in occasional cases of carcinoma of the corpus where the growth, having made its way through the uterine wall, has invaded the colon too low down for a colectomy to be feasible.

Preparation of the patient.—As for Wertheim's operation. To restrain the intestinal bacteria, 3.5 to 7 grammes of phthalylsulphathiazol is given daily by the mouth for 3 or 4 days prior to the operation.

Instruments.—As for Wertheim's operation, but the vaginal clamp is not necessary. An aneurysm forceps is better than an aneurysm needle for ligaturing the internal iliac arteries, and Greene Armytage's forceps (for use in Cæsarean section) will be found very useful to hold the bowel during the ureteral implantation.

Operation.—i. **Earlier stages.**—The technique at first follows that described for *partial exenteration*, except that the separation of the vagina from the rectum is replaced by separating the rectum from the face of the sacrum.

Also, although in some cases the upper parts of the cardinal ligaments may be accessible for division, more often they are too infiltrated or adherent for this, and their division is postponed until the lateral ligaments of the rectum are exposed, when cardinal ligaments and rectal ligaments are divided together.

ii. **Division of the colon.**—The ureters having been divided, the internal iliac arteries tied, the bladder entirely separated, except for its attachment to the vagina, and all the loose cellular tissue together with its contained glands having been pushed off the side walls of the pelvis,

the colon at a convenient place is divided between two clamps. The best pattern of clamp to employ is that of Parker Keze, with the adjustable shields to cover the cut ends of the bowel, invented by Lloyd Davies (Fig. 283).

iii. *Division of the mesentery and ligation of the inferior mesenteric artery.*—The mesentery is now divided down to its base, all vessels cut being seized and tied. The last of these is the inferior mesenteric artery, and this may be secured before division.

iv. *Separating the rectum from the face of the sacrum.*—The base of the mesentery having been opened out, two fingers are inserted between

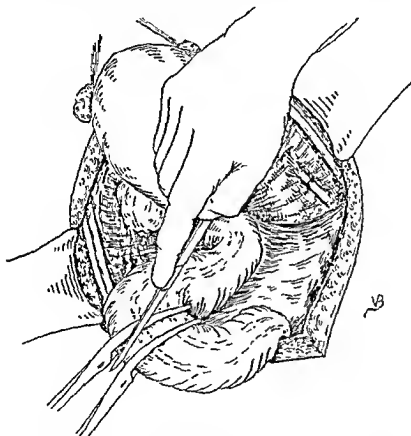


Fig. 283.—Complete pelvic exenteration. Dividing the colon between intestinal clamps.

the sacrum and the back of the rectum, and the two are separated down to the pelvic floor. This procedure is illustrated on p. 753.

v. *Dividing the peritoneum laterally.*—The peritoneum lateral to the rectum is now divided by scissors from above downwards, until the incision on either side joins the large raw surface in front of it.

vi. *Dividing the lateral rectal and cardinal ligaments.*—The bowel, uterus

and vagina are now pulled upwards and forwards, exposing the edges of the lateral rectal ligaments, and in front of them the edges of the cardinal ligaments. These are now divided throughout their whole length, the scissors being guided by the index finger of the left hand, until the pelvic floor is reached, and the mass to be removed is felt to loosen and ride up (Fig. 284).

vii. The removal.—Strong traction being made by the hand on the mass to be removed, the urethra is first cut across, then the vagina and lastly, after pulling it up as far as it will go, the rectum. If the mass to be removed has been thoroughly freed, except for the attachments of

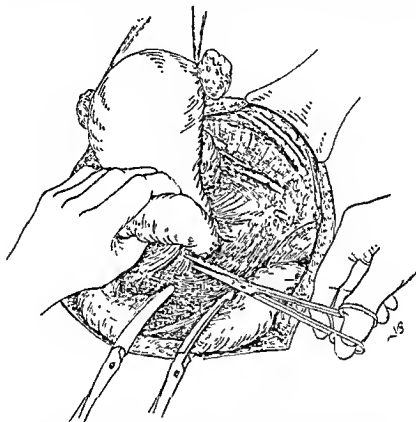


Fig. 284.—Dividing the lateral rectal and cardinal ligaments.

the urethra, vagina and rectum to the pelvic floor, it will be found that in the otherwise empty pelvis it is easy to divide these structures at practically their lower orifices, and thus render a two-way approach to the operation unnecessary in the majority of cases.

viii. Grafting the ureters.—All bleeding points in the large raw area having been secured, the ureters are grafted into the upper colon whose open end is still occluded by the bowel clamp. To render tense the wall of the bowel while this is being done, and avoid the possibility

of pulling off the clamp, the best instrument is that of Greene Armytage, already referred to (Fig. 285).

ix. *The colostomy.*—The clamp having been removed from the bowel end, this is now fixed in the upper part of the abdominal wound about 2 inches below its upper angle, thus creating a midline colostomy clear of the dip of the umbilicus, for in no other position is it possible to fit a colostomy belt which will restrain the mixture of urine and feces which will flow from the opening.

x. *Conclusion of the operation.*—The pelvis being lightly packed with flanne gauze, one end of which is brought out through the vaginal orifice, the abdominal wound is now closed in the usual way. (See p. 286).

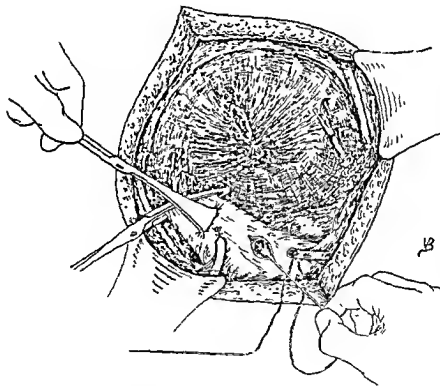


Fig. 285.—Grafting the ureters into the bowel prior to a central colostomy.

Difficulties and dangers.—What has been said under *Partial Exenteration* applies equally here.

The great drawback to the operation is the "wet" colostomy, but a special colostomy bag (Rutzen), has been devised which, if managed properly, keeps the patient fairly comfortable and dry.

The mortality of the operation in its inventor's hands is slightly greater than that for *partial exenteration*, which is what one would expect. Obviously, the performance of so tremendous an operation

should only be entertained when the reasons compelling it are overwhelming, but recovery and freedom from recurrence for a year or more can be achieved by it in a small proportion of the cases (13.5 per cent. Brunschwig). This is an astonishing result.

After treatment.—As for partial exenteration, p. 416.

The two-way operation.—If the growth has closely approached or extended to the vaginal introitus or involved the vulva the two-way operation is required. The abdominal part of the operation is performed as already described and the patient is then placed in the lithotomy position and the lower vagina and (if necessary) the vulva are excised *en bloc* with the rest of the extirpation. The rectum and even the anus may be involved and have to be removed too—the steps of these procedures are described on pp. 265, 102 and 733. The synchronous combined method of operating (*see* pp. 404 and 776) could well be applied to two-way pelvic exenteration.

CHAPTER XVIII

ABDOMINAL MYOMECTOMY*

The conservation of the uterus.—Since cure without deformity or loss of function must ever be surgery's highest ideal, the general proposition that myomectomy is a greater surgical achievement than hysterectomy is incontestable. Passing from the general principle to the particular argument, we have to consider the question of child-bearing not only from the national standpoint but also from the psychological point of view. The age-limit for conception varies according to whether the conception is a first or a subsequent one. For first conception 43 years of age may be taken as the practical limit, but for subsequent conception 45, so that at least up to 41 the preservation of the uterus deserves serious consideration for, as we shall presently show, pregnancy is not only possible but likely after such preservation. It is true that many women do not wish for children or more children, but that is a very different thing from desiring that the capacity for conception shall be taken away from them. The two must not be confounded. The conscious or subconscious knowledge of the power to conceive is the nucleus around which the feminine sex-emotions most commonly cluster, quite apart from whether or not a child is actually desired and, the central idea being gone, the emotions either wilt or transfer themselves to spheres of emotional activity other than sex. There are certain women, no doubt, in whom union with the beloved rather than the results of that union is the central idea, and to such the loss of the organ of conception will be less important in its psychic results. This is the male type of sexuality, but even in men the procreation idea bulks larger than the individual himself is usually aware of, and when the culminating act is condemned to irrevocable futility a weakening of the sex ties is very likely to ensue. An instinctive knowledge of this fact is at the back of many patients' objection to hysterectomy, and women thus marred not infrequently develop an inferiority complex under which they magnify trivial acts of forgetfulness into intentional slights and become touchy and suspicious.

Women who have borne children, especially many children, are on the average much less likely to be adverse to the idea of losing their wombs than women who have borne none, although among this latter

* The credit for being the pioneer in the development of myomectomy as performed to-day belongs to Alexander of Liverpool, who, in 1897-98, wrote three remarkable papers on the subject, which, however, found no favour at that time.

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group there are many whose chances of child-bearing in any circumstances are practically non-existent. The assurance afforded by the removal of the uterus against any further extension of the anxieties and self-sacrifices of motherhood is no doubt partly responsible for this average difference of attitude, but beyond it we think that the parous woman feels that having borne children the perfection of her femininity needs no further proof, just as a soldier, having shown his courage in the field, lays by his sword without regret or misgiving. Though the majority of men when they marry do so for affection and companionship and not for the sake of having children, yet there is a certain proportion to whom the rearing of a family is the chief incentive. The value, therefore, of a woman from the point of view of marriage is definitely lowered if she is wombless. *Fibroids* are relatively rare in young women, yet they are not infrequently met with, and surely it is a sorry reflection on surgery if it is not able to secure health for such patients without jeopardizing their future happiness, and on the gynæcological surgeon who is blind to the importance of leaving intact in its fullest possible strength the tie that binds together such totally dissimilar creatures as man and woman.

There exists such diversity in feminine character that no sweeping generalization on anything connected with the sex is possible, but this at least is true, that to a considerable proportion of women the removal of the womb is repugnant either because they hope to have children or wish to maintain the possibility of having them, or fear the effect on their own affections or on those of their husbands or lovers. Women in these matters do not commonly wear their hearts on their sleeves so that the surgeon frequently has little or no knowledge of the psychology of the patient whom he is advising. It is wisest for him, therefore, in the absence of expressed opinion one way or the other, to be as conservative as possible, bearing in mind that the patient in committing to him the fate of her womb is often entrusting him with her future happiness as well.*

Before describing in detail the operations for enucleating fibroids according to their position in the uterus, it will simplify matters if we consider, first of all, certain points which are more or less applicable to them all, as follows :

Delivery and inspection of the uterus.—The uterus having been delivered as far as possible out of the abdominal cavity, the size and position of the tumour or tumours should be studied (noting the number as far as may be possible at this stage) to determine if enucleation be feasible and, if so, where best to place the incision or incisions.

* The subject of Myomectomy is a very large one and readers desiring more minute information than is contained in this Chapter, are advised to read, as a supplement, "The Technical Minutes of Extended Myomectomy and Ovarian Cystectomy," by Victor Bonney, Cassell & Co. 1916, wherein the various operations are described in much greater detail.

Tumours situated in the anterior or lateral walls of the uterus are more favourable for enucleation than those in the posterior wall. Anterior cervical myomata are well suited for enucleation, but

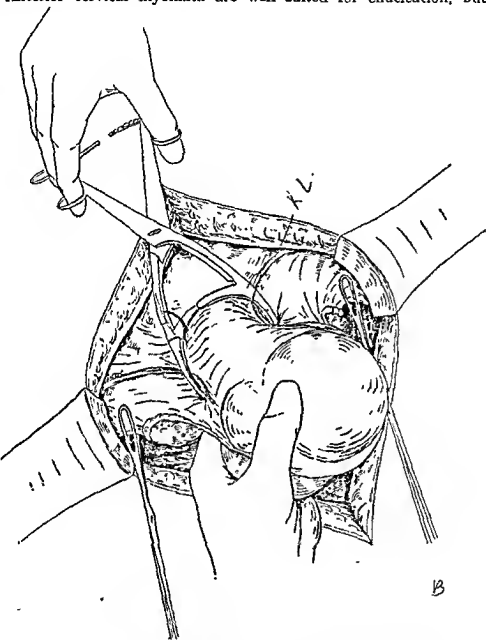


Fig. 286.—Applying the myomectomy clamp. Both round ligaments are included.

Posterior cervical tumours are much more inaccessible, and the bed left after their removal is difficult to get at.

Central cervical myomata usually enucleate very readily (see p. 339), but their removal leaves an immensely elongated supravaginal cervix, which is more difficult satisfactorily to deal with.

The uterus should be palpated very carefully in order to detect seedling tumours, the overlooking of which would jeopardize the final success of the operation, but this step is best postponed until the larger tumours have been disposed of or, especially, until the uterine cavity has been opened up, for this makes detection much easier.

Hæmostasis.—The principal objection to myomectomy in the past was the bleeding over which the operator had little or no control. Myomectomy to be ideal requires to be almost bloodless, for profuse oozing from the bed of the tumour so hampers the operator that there is not sufficient time for the removal of the smaller tumours and a neat reconstruction of the uterus afterwards before there are signs of severe blood loss. By the use of a clamp devised by one of us (V.B.), myomectomy can be performed on an almost bloodless uterus, so that not only can the operator work as deliberately as he chooses, but also, if in the end he finds it impossible to terminate the myomectomy satisfactorily, the patient, practically having not lost any blood, is in a perfectly good condition for hysterectomy.

The clamp is usually applied from the pubic end of the abdominal wound with the angle between the blades and the shanks opening downwards and should grip the round ligaments, otherwise, as the blades are approximated, they will slip down past the cervix on to the upper end of the vagina and the uterine vessels will no longer be controlled (Fig. 286). In some cases the instrument goes on better in reverse, i.e., with the angle between the blades and the shanks opening upwards. By the use of this clamp the blood flowing through the uterine vessels and cervix is arrested. The vessels themselves are not injured, being too well protected by the tissues in which they are embedded (see p. 13 and Fig. 19). The flow of blood through the ovarian vessels is arrested *pro tem.* by ring forceps; all the vessels going into it being thus occluded, the uterus is rendered almost bloodless. When the clamp and forceps are removed, on the completion of the operation, the uterus flushes up, but on returning to the abdominal cavity the flush soon passes off, and if the slight oozing from the suture holes does not then cease it can be stopped with an additional suture or two inserted where required.

A tumour low down in the body of the uterus or in the cervix prevents the clamp being applied. In such a case the tumour must be enucleated first and the clamp applied afterwards.

Pregnancy complicating fibroids forbids the use of the clamp while the child is within the uterus. For Cæsarean-myomectomy the blades should be nearly an inch longer than those of the standard pattern—for even after the child has been delivered the lower uterine segment is still very broad.

The various lines of incision. The primary incision in the uterus—Whenever feasible this incision should be made in the middle of the

anterior wall of the uterus so as to reduce, so far as possible, the risk of intestinal adhesion. An incision involving the peritoneal coat of the uterus carries with it the risk of post-operative oozing. If blood oozes from an anterior incision it does so into the utero-vesical pouch so that the bladder only can adhere, whereas blood oozing from a posterior incision involves the risk of small intestine adhering. Moreover, with an anterior incision, the operator can ventralfix the uterus in the line of the suture or, by shortening the round ligaments, oppose the suture line to the posterior surface of the bladder, or he may cover the suture line by a flap of peritoneum obtained from the lower uterine segment.

Secondary tunnelling incisions.—Tumours not readily accessible through a median anterior incision of the uterus may be reached by secondary incisions, tunnelling-off from it. As Alexander first stated, fibroids are sufficiently movable in the uterine wall to allow of their being pushed towards the opening through which it is desired to extract them, so that tumours situated in the lateral walls (if not too large) or even in the posterior wall, can be delivered through an anterior incision by making a tunnelling incision off the incision primarily made.

Transcavity incision.—If a tumour in the posterior wall of the uterus cannot be satisfactorily reached by a tunnelling incision, it is best reached by carrying the primary median incision into the cavity of the uterus and through its posterior wall.

Transverse incision.—If a tumour in the posterior wall of the uterus is too large to be delivered by a transcavity incision, a transverse incision is made across the uterus just posterior to the line of the insertion of the Fallopian tubes. The capsule of the tumour is then incised and the fibroid enucleated. That portion of the uterus which covered the tumour now hangs down behind like the hood of a monk, and can be dealt with as described under the hood operation (see p. 442).

Primary posterior incision.—Small superficial fibroids in the posterior wall cannot be enucleated by a tunnelling incision or by the hood method, and have to be enucleated by a posterior incision made directly over them, the sutures presenting on the posterior wall. Measures to prevent adhesion to such posterior incisions will be detailed later.

Enucleation and morcellation.—Small fibroids wherever placed are generally to be enucleated whole and the same applies to large ones if superficially placed. All deeply imbedded tumours of any size are best removed piecemeal by cutting them into bits (morcellation). This proceeding is much gentler than enucleation *en masse* and spares the patient the wrenching and pulling which the latter more or less necessitates.

Reconstruction of the uterus.—A uterus in which is embedded a fibroid or fibroids of any considerable size is more or less hypertrophied, so that after the tumours are removed an organ is left of abnormal bulk. The involution of the uterus after myomectomy not being so marked as

that after labour, more or less reduction in its size is necessary before the final sutures are inserted, otherwise menorrhagia, from the enlarged cavity, may persist after operation. Moreover, a bulky uterus is more

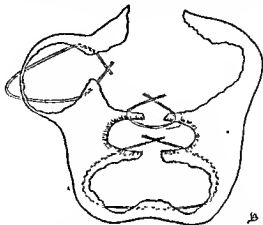


Fig. 287.—Diagram illustrating methods of closing enucleation cavities in myomectomy.

difficult to suture and involves more risk of post-operative oozing of blood. How best thus to reconstruct the uterus is a matter of experience and judgment: moreover, the hypertrophy is often unequally

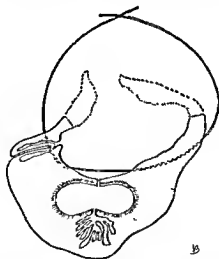


Fig. 288.—Lateral and posterior cavities closed. Suture for anterior cavity shown. The dotted portions are cut away.

distributed. In cutting away, therefore, any superfluous uterine tissue, regard must be paid to certain fixed points, such as the roots of the Fallopian tubes and the take-off of the round ligaments, otherwise the operator will find that he has fashioned an asymmetrical organ. The reconstructed uterus should be a little larger than the normal uterus to allow for the shrinkage due to involution (Fig. 295).

Suture of the enucleation cavities.—For this purpose catgut should be employed, and mattress and continuous sutures avoided as much as possible because they interfere with the blood supply to the tissue distal to them. For the closure of median anterior cavities a row, or sometimes tiers, of simple through-and-through sutures should be used. Anterior cavities in the middle line can often be occluded by through-and-through sutures, especially if part of the anterior wall of the uterus has been cut

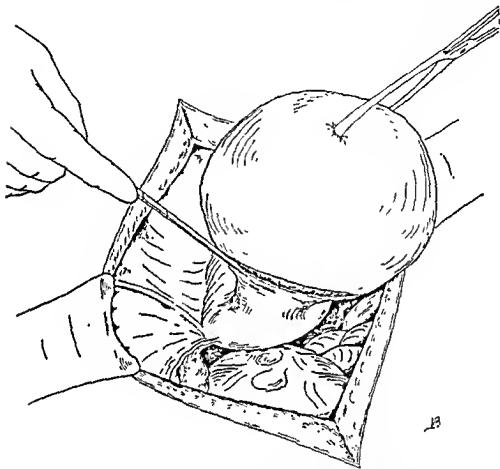


Fig. 289.—Myomectomy for a pedunculated subperitoneal myoma :
Dividing the capsule of the tumour.

away. Cavities in the lateral wall can usually be obliterated by deep sutures passed through the tissues that surround them, and tied across the mouth of the cavity. When, however, the cavity approaches very close to the peritoneal surface, another device is required. A suture is passed through the peritoneum forming its floor and then back again; the two ends are then passed through the stouter tissues bounding the mouth of the cavity so that, when the suture is tied, the peritoneum is drawn into the cavity and obliterated. Several of these sutures may be used. Cavities in the back wall of the uterus, the mouths of which

open out on the posterior endometrium after transcavity enucleation, can be closed by sutures passed through the tissue surrounding them and tied on the endometrial surface. The knots are well tolerated. If, however, as already described for the suturing of lateral cavities, the peri-

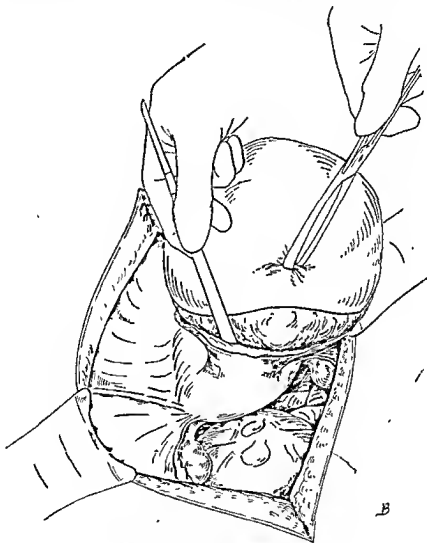


Fig. 290.—Enucleating the tumour.

mucoous polypus and thus, perhaps, leave behind the chief cause of the menorrhagia for which the operation may have been indicated. The opening of the cavity will not increase the risk of the operation, unless the uterus is already infected, in which event myomectomy should never be attempted.

In many of these cases the cavity will have been opened during the enucleation of the tumour or tumours, or, if not, can be readily opened through the incision made for the enucleation, but sometimes the

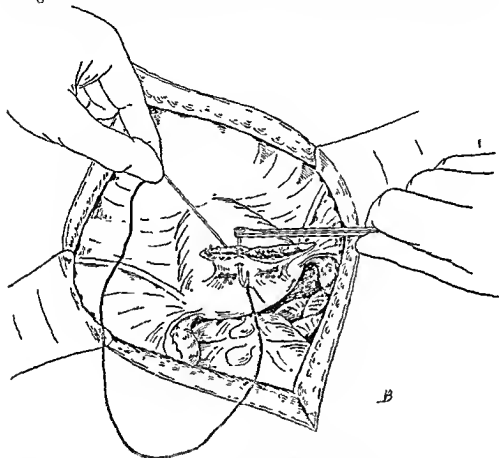


Fig. 291.—Suture of the pedicle.

surgeon has to make a separate incision. This should always be in the middle line of the anterior wall, and should be sutured in the manner described under hysterotomy (p. 496).

Ventralsuspending or ventralfixing the uterus.—In two circumstances it is advisable to ventralsuspend or ventralfix the uterus after myomectomy. The first is when the conserved organ, deprived of the support of the tumour, falls back into the hollow of the sacrum; the second when, in spite of careful suturing, oozing persists from an anterior uterine incision—a rare event.

In the first case the round ligaments may be shortened either by

Myomectomy versus hysterectomy.—The fact that fibroids of the uterus beyond the scope of conservative surgery are uncommon does not indicate that myomectomy is the operation of choice in the majority of patients suffering from these tumours. For women over 41 years of age myomectomy is to be preferred to hysterectomy only when it is the lesser operation of the two, or the patient, for reasons

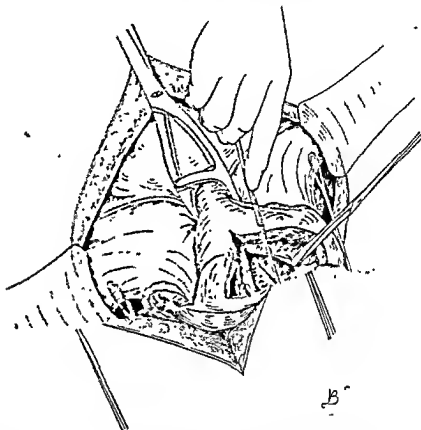


Fig. 292.—Myomectomy for an anterior interstitial myoma: Enucleating the tumour.

advantage of entirely covering up the incision (or incisions) in the anterior uterine wall.

In the second case the uterus should be attached to the anterior abdominal wall along the line of the oozing anterior incision. This may be done by fixing it by sutures passing through the aponeurosis as described on p. 588, or, if the operator does not desire to create immovable fixation, then by merely suturing the anterior parietal peritoneum to the uterine wound so as to cover it and prevent escape of blood into the peritoneal cavity.

Multiple myomectomy.—Fibroids being more often multiple than solitary, the task set the surgeon is more often the removal of a

of tumours than a single one. Provided that efficient hæmostasis during the operation can be effected, the number of tumours it is possible to remove is very large indeed. One of us (V.B.) has removed as many as 225 from a single uterus. When performing multiple myomectomy the various devices presently to be described under the heads of myomata in different situations have to be combined according to the situation of the tumours in the particular case. The removal of the smaller tumours is

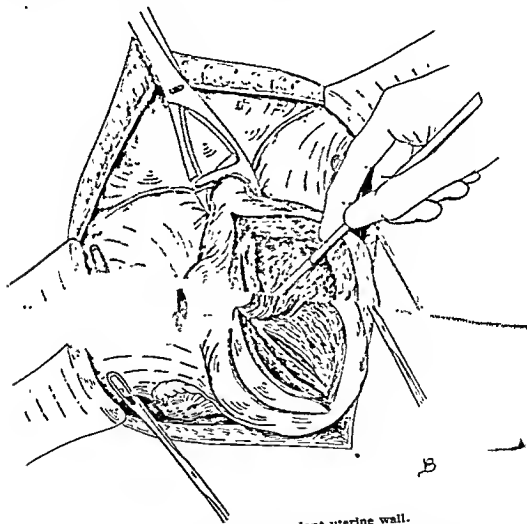


Fig. 295.—Excising the redundant uterine wall.

The risk of myomectomy as compared with hysterectomy.—The risk especially attaching to myomectomy is hæmorrhage either during or after the operation. Excessive loss of blood during the operation can be completely prevented by the use of Bonney's myomectomy clamp. Postoperative oozing from the uterine incisions is a serious complication, for if it occurs, not only is convalescence rendered febrile, but there is a very definite danger of a coil of intestine

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and naturally, or if one or more of the fibroids has undergone necrosis or some other accident and an operation is imperative. Hysterectomy in a pregnant woman may be followed by a miscarriage, but it is remarkable how seldom this occurs, and we have

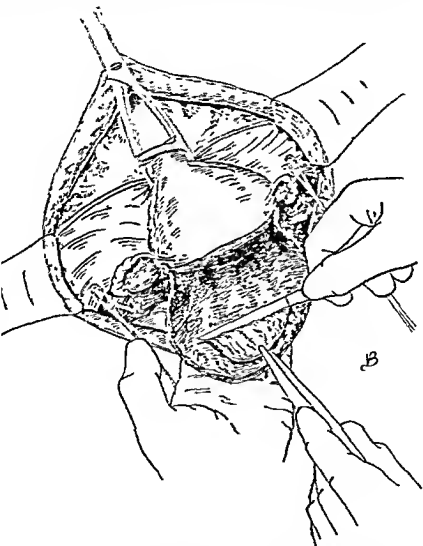


Fig. 298.—Reducing the thickness of the hood by planing it.

removed a number of fibroids (largest number, 9) from a uterus on many occasions, and most of these women have birth to a living child followed by further pregnancies.

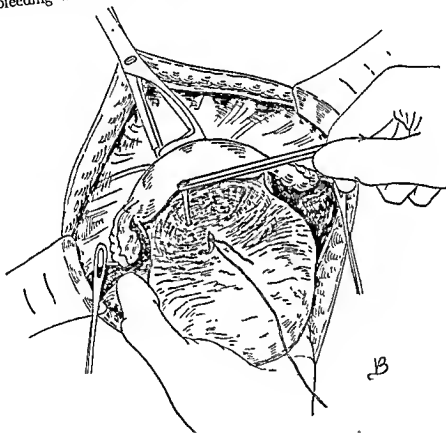
In some cases of fibroids complicated by the presence of a non-

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ABDOMINAL MYOMECTOMY

xviii]

If the child is viable it should be delivered by Cæsarean section and the enucleation of the tumours then proceeded with. So long as the child is within the uterus the myomectomy clamp cannot be applied, and for this reason the child should always be removed first. The incision to remove the child should be placed wherever is most convenient so as to avoid cutting through the tumours, for if these are large, great bleeding will follow an incision through them. Its position is a



The operation is contra-indicated if the uterus is infected.

Instruments.—See p. 262. In addition, a myomectomy clamp.

Operation. i. Opening the abdominal cavity.—See p. 274.

ii. Delivery and inspection of the uterus.—See p. 422.

iii. Applying the myomectomy clamp.—See p. 424.

iv. Incision of the capsule.—This should be in the middle line and large enough to permit extraction of the tumour.

v. Enucleation of the tumour.—The incision should be carried right

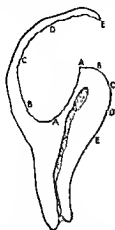


Fig. 302.—Diagram showing the capsule left after the enucleation.



Fig. 303.—Diagram showing the "hood" in place.

into the substance of the tumour, so that the plane of cleavage between it and its capsule can be plainly seen. By means of the handle of the scalpel, or the index finger thrust in under the capsule, aided by strong traction with a volsellum fixed on the myoma, the tumour is then enucleated (Fig. 292). The ease with which this is done varies. Some myomata shell out very readily, but others need the exercise of a good deal of force. When the tumour is large and does not readily enucleate, it is better to cut it away in bits (morcellation), and thus avoid the pulling and wrenching which is so disadvantageous to the patient. An adeno-myoma, not having any capsule, cannot be enucleated and will have to be cut out.

vi. Opening the uterine cavity.—If the primary incision has not opened the uterus it should be deepened until it does. This step is not necessary in all cases but is advisable in most (see p. 399).

vii. Removal of redundant uterine wall.—Uterine tissue in excess of that needed to remake the uterus must now be cut away (p. 396 and Fig. 295).

viii. Suture of the enucleation cavity.—This is effected by a series of interrupted sutures of No. 1 20-day catgut passed deeply through the walls of the capsule, and, if need be, under-running the floor of the bed of the tumour, inserted, if possible, so as not to penetrate the

endometrium. If the cavity is very deep tiers of sutures may be used. (Figs. 287, 288). If a spouting vessel is seen it can be separately ligatured.

ix. Completing the reconstruction of the uterus.—The peritoneal edges of the uterine incision are now approximated by interrupted sutures of No. 1 20-day catgut. A well-sutured uterine incision should not exhibit any marked anæmia along the line of the sutures.

x. Ventralfixing the uterus.—This is not as a rule necessary.

xi. Closing the abdominal cavity.—See p. 286.

Dressing and after-treatment.—See p. 24 and Chapter xxx.

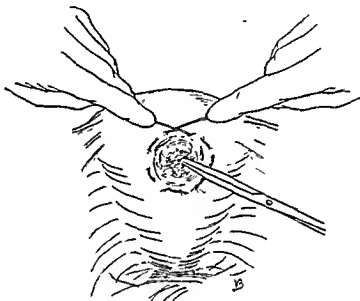


Fig. 304.—Diagram illustrating the circular in-turning suture as applied in myomectomy.

MYOMECTOMY FOR A LATERAL MYOMA

A fibroid lying in the lateral wall of the uterus can be enucleated by an antero-lateral incision directly over it. When the uterus, however, also contains an anterior fibroid, the best way to enucleate the lateral fibroid is by a secondary incision tunnelling off from the incision made to enucleate the anterior fibroid (Fig. 293). By this method only one incision need be made through the surface of the uterus. The methods of suture are shown in Figs. 287, 288.

MYOMECTOMY FOR A POSTERIOR MYOMA

There are three ways of dealing with a fibroid in the posterior wall of the uterus, according to its exact position there and its size; the object of the first two of them is to avoid the disadvantages, already detailed, of a suture line on the posterior peritoneal surface.

The operation is contra-indicated.

Instruments.—See p. 262.

Operation. i. Opening

ii. Delivery and inspersion

iii. Applying the suture

iv. Incision of the capsule

large enough to

v. Enucleation



Fig. 302.—Diagram of capsule left after the operation.



Fig. 303.—Diagram showing the "hood" in place.

into the substance of the tumour. The incision between it and its capsule can be performed with the scalpel, or the index finger, or the forceps, or by strong traction with a volsellum, or by the use of the enucleator, then enucleated (Fig. 292). The ease with which this is done. Some myomata shell out very readily, and require little or no force. When the tumour is large, it is better to cut it away in bits, and to avoid the pulling and wrenching which is so disastrous. An adeno-myoma, not having any capsule, will have to be cut out.

vi. Opening the uterine cavity.—If the peritoneum is opened the uterus it should be deepened until it is necessary in all cases but is advisable in most (see p. 395).

vii. Removal of redundant uterine wall.—Uterine tissue in excess of what is needed to remake the uterus must now be cut away (p. 396 and 397).

viii. Suture of the enucleation cavity.—This is done by interrupted sutures of No. 1 20-day catgut placed through the walls of the capsule, and, if need be, under the floor of the tumour, inserted, if possible, so

of cleavage between the hood and the capsule.

v. Opening the uterine cavity.—This should be done in all cases to make sure that the cavity does not contain a fibroid too small to be detected by touch. A midline incision through the front wall of the enucleation cavity should be employed, and subsequently closed by suture. When the fibroid is submucous the posterior endometrium is much expanded over its surface so that, after the cavity has been opened,

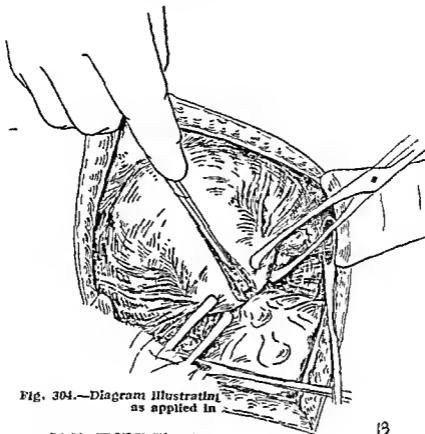


Fig. 304.—Diagram illustrating as applied in

MYOMECTOMY FOR

A fibroid lying in the lateral by an antero-lateral incision ^{is} ~~is~~ for a central cervical myoma : ever, also contains an anterior ^{ly} ~~ly~~ the uterus. lateral fibroid is by a second made to enucleate the anterior ^{ly} ~~ly~~ removed by scissors and the opening into one incision need be made methods of suture are show

oids.—There may be other tumours besides MYOM ^{at} ~~at~~ wall, for instance in the anterior or lateral wall, or event, after removing the posterior tumour, the surgeon

There are the anterior wall in the manner already described under of the uteromata, and proceed to remove them in that way and, when object of sutured this incision or incisions, bring the hood over to the detailed, the uterus and thus leave only one suture line on the surface.

(B) **Trans-cavity enucleation.**—This is suitable for posterior fibroids not much exceeding a golf ball in size.

i. **Opening the uterine cavity.**—The uterine cavity is opened in the midline in front and, any anterior or lateral tumours having been

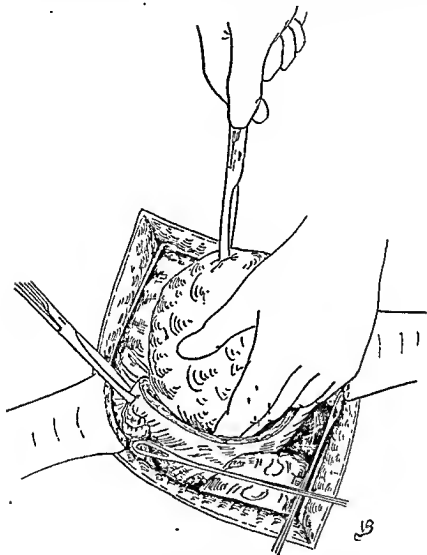


Fig. 307.—Enucleating the tumour.

removed as shown in Figs. 292 and 293, the posterior endometrium is incised over the posterior tumour and enucleation then proceeded with. If the tumour is large it can be morcellated (Fig. 294).

ii. **Closing the enucleation cavity.**—If this is superficial in regard to the endometrium, simple interrupted catgut sutures tied on the endometrial surface will suffice. If, however, it is deep beneath it or

approaches the posterior peritoneum, deep sutures or the inturning suture described on p. 427 will be required in addition. Knots on the surface of the endometrium are perfectly well borne.

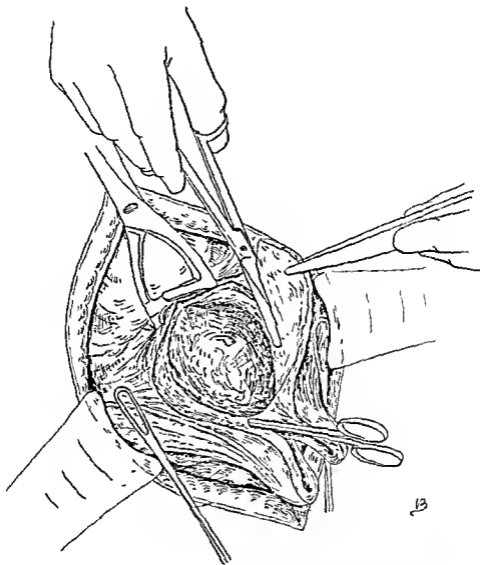


Fig. 308.—Cutting away redundant cervical wall: A forceps is passed down the cervical canal to define its position.

(C) By a posterior primary incision.—When the fibroid, or fibroids, are small and projecting just under the posterior layer of peritoneum covering the uterus, they have to be removed by a primary incision over them. The cavity is then closed by a purse-string suture around some little distance from its mouth, which obliterates it and leaves the peritoneum invaginated (Fig. 304). If, however, this device fails a sutured wound will have to be left fronting back on the intestines.

If the wound is situated low down, the pelvic colon should be attached over it by a few catgut sutures, as the resulting adhesion will not do any harm. If, however, the uterine wound is too high up for this, one mesosalpinx, or even the whole appendage, may be swung in and

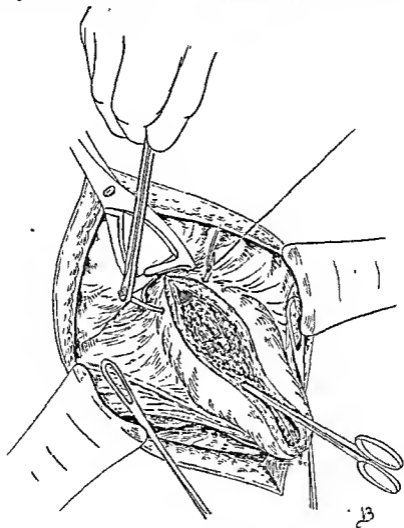


Fig. 309.—Suture of the uterus: A forceps is passed down the cervical canal to define its position.

sutured over the wound so as to cut it out from the general peritoneal cavity (Fig. 305).

MYOMECTOMY FOR CENTRAL CERVICAL MYOMA

The performance of myomectomy for central cervical myoma is more difficult than that for myomata of the body or broad ligaments,

in the first place, because the myomectomy clamp cannot be applied till after the tumour is enucleated and, in the second place, because of the great elongation of the supravaginal cervix which remains after the tumour has been removed.

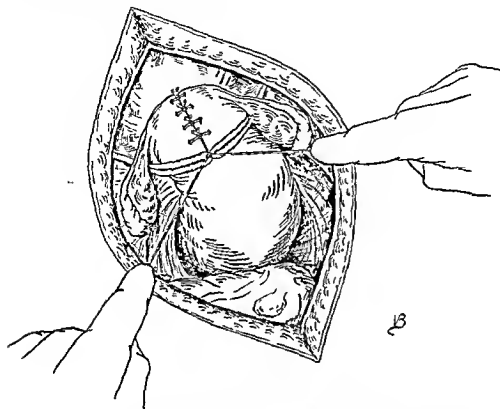


Fig. 310.—The uterus ante-flexed by the sling formed from the round ligaments.

Operation. i. Bisecting the uterus.—Ring forceps having been applied to the ovario-pelvic ligament on either side and the fundus of the uterus having been seized on each side with a volsellum, the uterus is bisected in the middle line until the capsule of the tumour is opened. The bisecting incision should reach further downwards on the anterior than on the posterior wall (Fig. 306).

ii. Enucleating the tumour.—The tumour is now enucleated in the way already described under hysterectomy for a central myoma. See p. 346. This part of the operation should be accomplished as quickly as possible to minimize the amount of hæmorrhage (Fig. 307).

iii. Defining the cervical canal.—The position of the cervical canal should now be defined by passing a long pair of forceps down it from the cavity of the uterus. If this is not done there is a considerable likelihood of cutting the cervical canal away when excising the redundant cervical tissue.

iv. Application of the myomectomy clamp.—The clamp is now applied and the circulation through the uterine arteries is arrested. The clamp, contrary to its use in other forms of myomectomy, should not include the round ligaments.

v. Cutting away the redundant cervical tissue.—The redundant cervical tissue is now cut away with scissors according to the amount which the surgeon thinks fit (Fig. 308).

vi. Suture of the enucleation cavity.—What remains of the enucleation cavity is now closed by interrupted catgut sutures in one or several layers. Care must be taken not to penetrate, or surround, the cervical canal. The forceps in the cervical canal will prevent such a mistake (Fig. 309).

vii. Suture of the uterus.—The bisected uterus is now joined together by interrupted catgut sutures in the same manner as described under utriculoplasty (*see* p. 499).

viii. Dealing with the elongated cervix.—In spite of the fact that the cervical tissues very considerably retract immediately the tumour is removed, the reconstructed uterus has an abnormally long cervix, so that the fundus of the uterus lies very much higher than normal. The best way to deal with this difficulty is to perform the sling operation as described on p. 600 (Fig. 310). This procedure ontelflexes the uterus very markedly and brings the body of the uterus up against the bladder.

MYOMECTOMY FOR AN ANTERIOR OR POSTERIOR CERVICAL MYOMA

These tumours are easier to remove than those centrally situated because the cervix, as a whole, is not expanded over them. The ovarian vessels should be clamped beforehand.

When the tumour is *anterior*, the incision through the peritoneum should be transverse, from one round ligament to the other, and made through the loose peritoneum at its junction with the body of the uterus, well above the line of the bladder which, in these cases, is often much raised. The peritoneum, having been divided, is stripped down until the bladder is reached; this viscus is carefully separated from the front of the tumour capsule, which is now incised either vertically or transversely, as appears most convenient, and the tumour is enucleated whole or in bits.

Although the myomectomy clamp cannot be applied beforehand, there is not as a rule much bleeding and what there is can readily be controlled by pressure forceps. Redundant cervical tissue having been cut away, the enucleation cavity is closed by interrupted catgut sutures, after which the transverse incision in the peritoneum is closed by a continuous suture.

Posterior cervical tumours are best dealt with by a vertical incision through the loose peritoneum covering them. The capsule is then opened and the tumour enucleated, either whole or in bits. Redundant tissue having been cut away, the enucleation cavity is closed by interrupted catgut sutures, and the incised peritoneum is closed by a

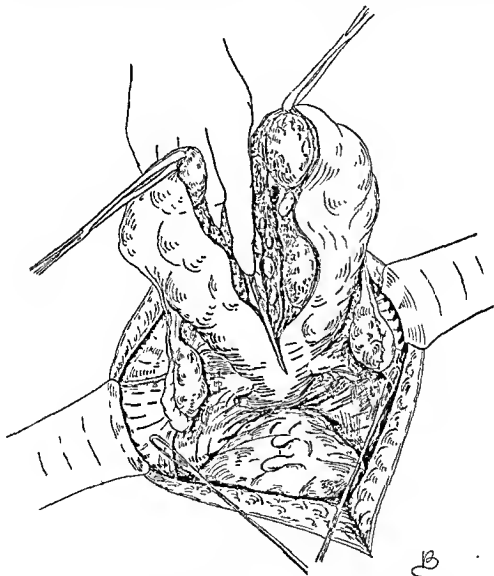
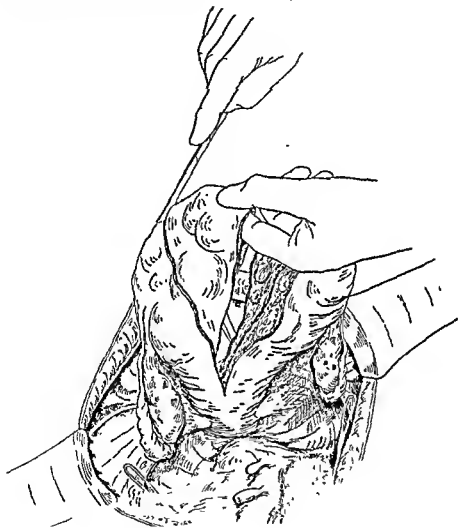


Fig. 311.—Myomectomy by block-excision: Bisecting the uterus.

continuous suture. The suture line on the posterior surface is situated so low down that only the colon will adhere to it; this adhesion is of no moment.

There is a rare variety of posterior cervical myoma in which the tumour lies very low down, most of it being between the rectum and vagina. In such the incision should be transverse between the end of

the colon and the back of the uterus. The cavity left cannot be obliterated by sutures, so the mouth only of it should be closed. The blood and serum which subsequently accumulates in it almost invariably absorbs without trouble.



Operation.—*i.* The myomectomy clamp having been applied, if necessary first enucleating any cervical tumour which prevents it, and ring forceps placed on the ovarian vessels, the uterus is split into two halves by a median sagittal incision as far down as the internal os, each half of the uterus being separated by means of volsella (Fig. 311).

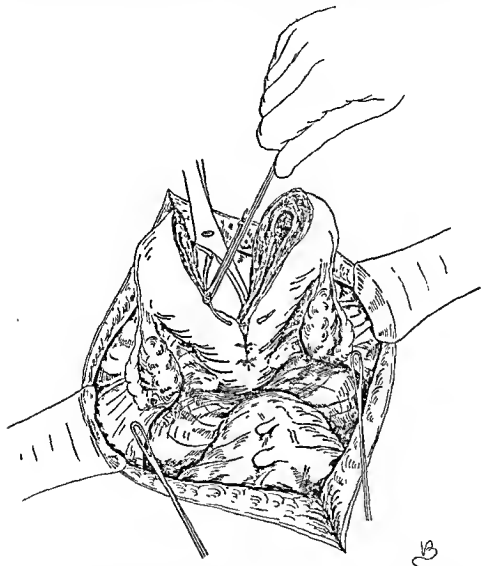


Fig. 313.—Suturing the two reduced halves of the uterus together.

ii. So as not to injure the interstitial portion of the Fallopian tube the operator, having first passed his finger into the cornu to make certain of the line in which this portion is running, marks out with the scalpel the line along which he intends to cut, paying also attention to the position of the round ligament (Fig. 312).

iii. A wedge-shaped mass, including both the uterine wall and its contained fibroids, is then excised from each half of the uterus.

iv. The uterus now consists of two much reduced halves, from which, perhaps, a few more fibroids need enucleating.

v. The halves of the uterus are then brought together by interrupted catgut sutures (Fig. 313). The sutures uniting the two halves of the

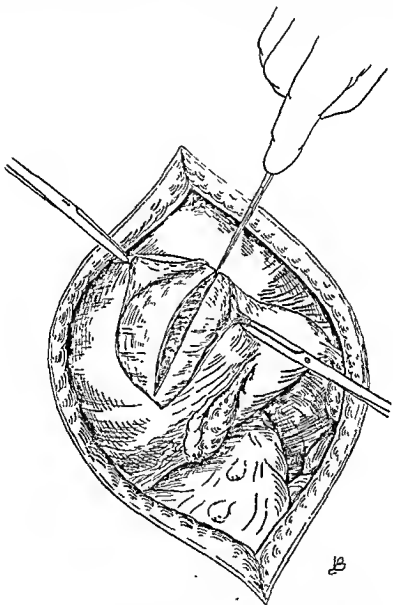


Fig. 314.—Myomectomy for a broad-ligament myoma: Incising the capsule.

posterior wall of the uterus should be tied on the peritoneal surface and the incised edges of the posterior endometrium should be separately united by a series of sutures tied on the mucous surface. Similar sutures,

but tied in the depths of the anterior wall, close the edges of the anterior endometrium and then the anterior wall itself is sutured.

This operation has the disadvantage of leaving a great length of suture line opposed to the intestine.

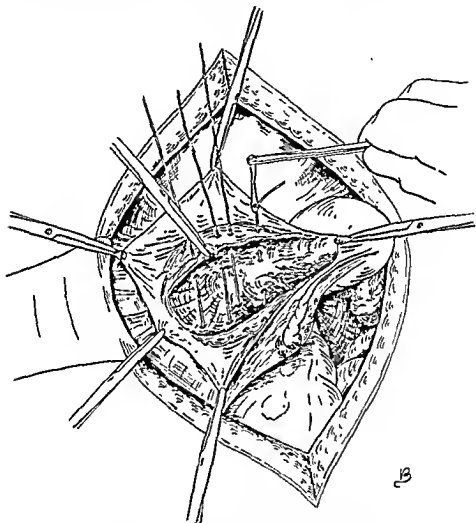


Fig. 315.—Suture of the enucleation cavity.

MYOMECTOMY FOR A BROAD-LIGAMENT MYOMA

The technique to be employed depends on whether the tumour is a true or false broad-ligament myoma (see p. 334).

True broad-ligament myoma.—The operation is exactly the same as that for enucleating a cyst from the broad ligament (see p. 634). The ureter runs on the inner side of and below these tumours as a rule.

False broad-ligament myoma.—As already pointed out, these tumours grow from the lateral wall of the uterus and carry the uterine vessels and ureter outwards. They are covered by a capsule of stretched

iv. The uterus now consists of two much reduced halves, from which, perhaps, a few more fibroids need enucleating.

v. The halves of the uterus are then brought together by interrupted catgut sutures (Fig. 313). The sutures uniting the two halves of the

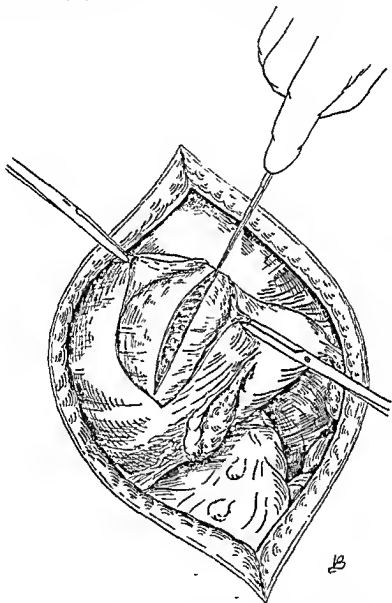


Fig. 314.—Myomectomy for a broad-ligament myoma: Incising the capsule.

posterior wall of the uterus should be tied on the peritoneal surface and the incised edges of the posterior endometrium should be separately united by a series of sutures tied on the mucous surface. Similar sutures,

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This operation has the disadvantage of leaving a great length of suture line opposed to the intestine.

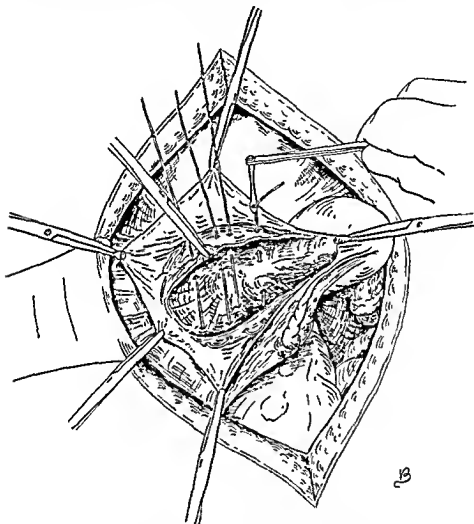


Fig. 315.—Suture of the enucleation cavity.

MYOMECTOMY FOR A BROAD-LIGAMENT MYOMA

The technique to be employed depends on whether the tumour is a true or false broad-ligament myoma (*see p. 334*).

True broad-ligament myoma.—The operation is exactly the same as that for enucleating a cyst from the broad ligament (*see p. 634*). The ureter runs on the inner side of and below these tumours as a rule.

False broad-ligament myoma.—As already pointed out, these tumours grow from the lateral wall of the uterus and carry the uterine vessels and ureter outwards. They are covered by a capsule of stretched

uterine tissue, whereas a true broad-ligament myoma has no such capsule. The steps of the operation are as follows :

i. An incision is made over the tumour dividing the peritoneum and also the round ligament which is usually stretched across it. The peritoneum is now reflected downwards and outwards until the bladder (which on the side of the tumour is usually considerably raised) is reached, when it in turn is separated out of the way.

ii. The capsule of the tumour is now incised, the plane of cleavage defined, and the tumour shelled out (Fig. 314).

iii. As much of the capsule as possible is now cut away, taking great care not to injure the ureter, the position of which should be defined either by feeling or seeing. The uterine artery should not be divided.

iv. The remainder of the capsule is now sutured by a series of interrupted catgut sutures passed so that they do not include the base of the capsule. The cavity is therefore not entirely obliterated, but the blood and serum which accumulates in it nearly always absorbs without trouble.

v. The peritoneal edges are now united, including the severed round ligament, any redundant tissue being first cut away.

Difficulties and dangers.—As the myomectomy clamp cannot be applied until after the tumour is removed, bleeding may be free. The ovarian vessels should be clamped previously. Injury to the ureter and bladder is the chief danger, and the surgeon should be careful to define their positions.

Difficulties and dangers of myomectomy in general. i. **Hæmorrhage.**—The dangers attendant on enucleation are chiefly due to hæmorrhage. Extensive enucleations, especially the block-excision of fibroids, and myomectomy for a central cervical fibroid, or on the pregnant uterus, may be accompanied by exceedingly free bleeding unless steps be taken to prevent it. The myomectomy clamp will in most cases render the uterus almost bloodless, but it cannot be employed in cases of central cervical fibroids, or in myomectomy on the pregnant uterus, before the fibroid is enucleated or the child delivered. In such cases, a reference to the description of these respective operations will indicate how the bleeding may be controlled so far as possible.

It may happen that the surgeon, having begun an enucleation operation, finds the bleeding so extreme as to render safe completion of the operation unlikely. In such a case he should desist and remove the uterus but he will find, as he gains experience, that such cases become fewer and fewer.

ii. **Injury to the bladder or ureters.**—When enucleating a broad-ligament or cervical fibroid, care must be taken not to injure the bladder or ureters (*see p. 777*).

iii. **Injury to the interstitial portion of the Fallopian tubes.**—In view

of the fact that, if these structures are injured, one of the principal objects of myomectomy will be destroyed, great care should be taken to avert such an accident, especially when performing block-excision.

iv. Sepsis.—We have already laid it down as irrefutable that myomectomy should not be attempted on a uterus which is septic. For the rest, in no operation is asepsis more important. The greatest care, therefore, should be taken to approximate the raw surfaces, which are often very large, and to prevent oozing from the suture lines. Catgut sutures should always be used.

v. Adhesions.—Next to hæmorrhage, the greatest risk to the patient is for adhesions to form between the small intestines and the suture lines, perhaps followed by intestinal obstruction. The various methods of preventing such adhesions have been described under the details of the various operations. Especially is it important to make the suture line lie on the anterior wall of the uterus whenever possible, for the reasons already stated (*see p. 424*).

vi. Myomectomy impossible.—As we have already remarked, it may happen that, on an occasion when the operator has intended to perform a myomectomy, he finds during the course of the operation that this is impossible. He will, therefore, be well advised to explain to his patient beforehand that, while he will save her uterus if this is feasible, circumstances may arise which render the conservative operation impossible.

vii. Adeno-myomata.—These tumours, the product of endometriotous invasion of the uterine muscle, have no capsule, so that if it is desired to conserve the uterus they must be cut out. We have done this satisfactorily on many occasions.

Concluding remarks.—The results of this operation in our hands have been excellent. The mortality has been only 1.1 per cent. New fibroids only appeared in 2.3 per cent. of the patients and persistent or recurrent menorrhagia in 3.1 per cent.*, while of the patients of an age to become pregnant, *wishing to do so and married*, 38 per cent. did conceive.

i. Continuance of menorrhagia.—If excessive menstrual loss continues after myomectomy, it is due either (a) to a small submucous fibroid missed at the operation; (b) to endometrial thickening; (c) to the fact that the uterus has remained much hypertrophied although all the tumours have been removed, or (d) to a degenerate condition of the uterine wall.

(a) *A missed submucous fibroid.*—It is very easy to miss a small submucous fibroid, say the size of a pea, if the uterine cavity is not opened and inspected in the course of the operation, for so diminutive a tumour is with difficulty felt through the uterine wall. Hence the operator should, as a routine, open the uterine cavity in all cases in which menorrhagia has been present (*see p. 428*).

* Including the cases where new fibroids developed.

(b) *Endometrial thickening.*—In certain cases of fibroids, diffuse thickening of the endometrium is present, while in others a local overgrowth in the form of a mucous polypus exists. Both abnormalities, if not dealt with, will maintain hæmorrhage after the operation. The incision into the uterine cavity discloses them. Curettage is far more efficiently performed by this route than *via* the cervix, and the scalpel handle is the best instrument to use, special attention being paid to the cornua. A mucous polypus should be similarly ablated.

(c) *Hypertrophy of the uterus.*—With all interstitial and submucous fibroids of any size, hypertrophy of the uterus enclosing them necessarily co-exists. The condition is, indeed, in this particular exactly analogous to pregnancy. It is necessary, therefore, in these cases not merely to remove the tumours but to trim down the uterus to a reasonable size (*see p. 425*).

(d) *Degeneration of the uterine wall.*—The hæmorrhagic states of the uterine wall that used to be included under the term fibrosis may co-exist with fibroids, and in such cases hysterectomy should be performed, not myomectomy. The conjunction, however, is a rare one, the uterine musculature over a fibroid being, as a rule, conspicuously well developed. A smooth, flabby appearance of the uterine wall in a case marked by menorrhagia, especially if there is no enlargement of the cavity, suggests that the general state of the uterine wall is the cause of the hæmorrhage rather than the fibroids, and should determine the removal of the uterus.

ii. *Recurrence of tumours.*—The tendency to the formation of fibroids is a passing phase in the uterine tissues and not a continuous defect, for otherwise myomectomy would be bound to fail in a very large proportion of the cases, whereas, in fact, recrudescence is quite rare.

I believe that in most instances the nuclei of all the fibroids a woman is ever going to grow are laid down by the time she is 30 years of age, or but little over. It follows that the chance of recurrence, before the age of 34 say, is greater than when myomectomy is performed after that age, especially when the number of tumours which have been removed at the operation is considerable. When fibroids develop at a very early age a special tendency to the formation of such tumours must be inferred and, therefore, the chance of new fibroids forming must be considerable, not only because the patient has more years before her in which to form them, but also because the uterine tissue itself is, in its fibroid-forming tendency, peculiar. On the other hand, it is just in these exceptionally young patients that the desirability of conserving the uterus is greatest, and if surgery can restore their marriage value for even a few years or, better still, enable them to give birth to a child, the gain effected is great, even though in the end hysterectomy becomes inevitable. *See also p. 937.*

iii *Future pregnancy.*—The fear that the uterus after myomectomy

will not stand the strain of pregnancy is groundless. There is probably no tissue in the body that heals so perfectly as the uterine muscle. We have had many opportunities now of viewing through an abdominal incision the after-results of this operation, and on no occasion could a trace be seen of the incisions in the uterine wall. This is in keeping with what one finds when performing *Cæsarean section* on a woman who has previously been delivered through the abdomen.

in which the incision is made anywhere in that area of the anterior uterine wall which is covered by the loose peritoneum of the utero-vesical pouch, or even above that area, so long as the peritoneal flap

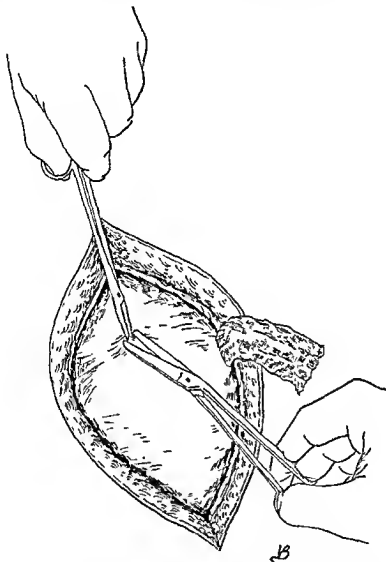


Fig. 316.—Lower segment Caesarean section: dividing the loose peritoneum.

which is reflected is subsequently re-affixed to the uterus above the line of the uterine incision.

The lower segment operation has three great advantages over the classical or upper segment operation: firstly, as the operation area does not encroach on the area of the intestines, nor is the uterus withdrawn from the abdomen, the likelihood of post-operative distension,

with all its discomforts and dangers, is much diminished; secondly, the uterus does not subsequently adhere to the abdominal scar; and thirdly, the child is extracted by the head instead of by pulling on the legs and breech, a much gentler method of delivery. Further, in those

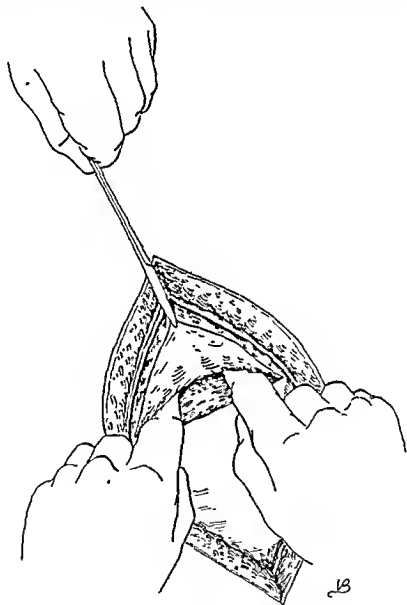


Fig. 317.—Separating the peritoneal flap.

cases in which the uterus is infected before the operation, the chances of infecting the general peritoneum in the course of the operation are much lessened.

We shall therefore describe this procedure first, the technique we employ being that devised by one of us (V.B.) to minimize bleeding and

extract the child as gently as possible through the smallest possible incision.*

Preparation of the patient (see p. 78).—On the operating table the catheter should be passed and then the vagina swabbed out with Violet-green.

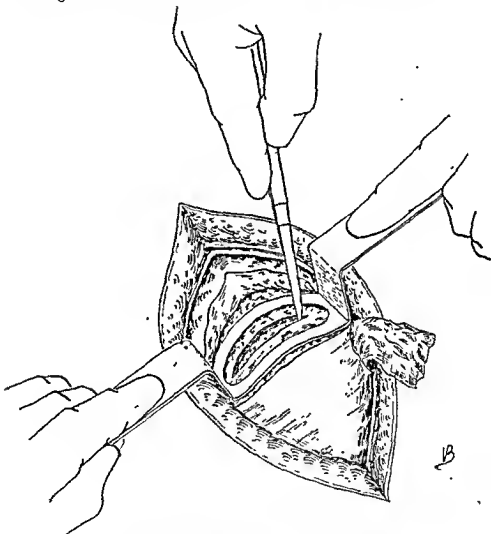


Fig. 318.—Lower segment Caesarean section: Incising the lower segment in the area bounded by the compressor.

Instruments.—Those given on p. 274 and in addition four pairs of Willett's scalp forceps and Bonney's uterine compressor.

Position of the patient.—She should be in a moderate Trendelenburg tilt, which can be increased to make a head low down in the pelvis

* Victor Bonney: "Lower Segment Caesarean Section: The use of Willett's scalp forceps and a uterine compressor," *Lancet*, April 5, 1933.

gravitate out of it and thus become more accessible. When the child is delivered, the tilt should be reduced to the minimum, for a uterus dragged upon by gravity does not retract well.

Ergometrine.—Immediately before the abdomen is opened 1 c.c. of ergometrine should be given by *intravenous* injection.

Operation. i. Opening the abdomen.—The incision should extend

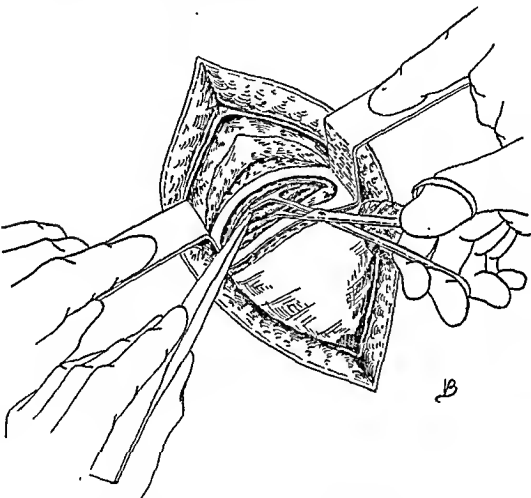


Fig. 319.—Seizing the scalp with Willett's forceps.

from the pubes to within 1 or 2 inches of the umbilicus. It should be in the middle line.

ii. Packing round the uterus.—Gauze soaked in saline solution is now packed round the uterus, beginning at one round ligament and continuing above the upper limit of the abdominal incision to the other round ligament.

iii. Reflecting the peritoneal flap.—The position of the head being defined, the loose peritoneum in front of it is nicked with scissors (Fig. 316) and the incision extended laterally, the peritoneum in the meantime

being separated from the uterine wall by the fingers (Fig. 317). A flap is thus raised which should extend outwards to near the round ligaments. It is of peritoneum only.

iv. Applying the compressor.—The flap being drawn back by a pair of forceps, the compressor is applied to the uterine wall over the head

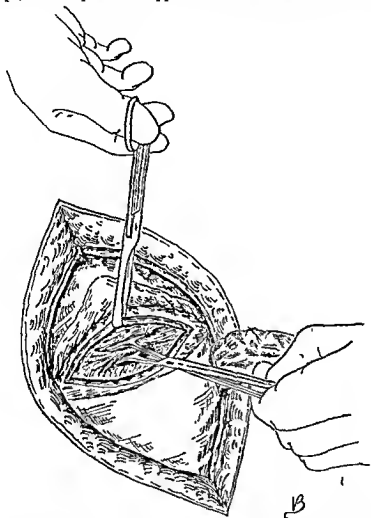


Fig. 320.—Fixing a volsellum on the edge of the uterine incision.

and kept pressed upon it by the hands of an assistant on each side and the index finger of the operator's left hand. The pressure thus applied makes the area within the oval of the compressor avascular, so that when the incision is made little or no blood should escape.

v. Incising the uterus.—The surgeon now makes a cut about $1\frac{1}{2}$ inches long, transverse to the line of the body and within the oval of the compressor, and gradually deepens it until the scalp of the child shows (Fig. 318).

vi. Applying a Willett's forceps.—Having first rucked up the scalp with dissecting forceps, the surgeon grasps the rucked-up portion with a pair of Willett's forceps (Fig. 319).

vii. Removing the compressor.—The compressor is now removed, the surgeon meantime making gentle traction on the scalp so as to keep the head pulled up against the uterine wound, thereby preventing any

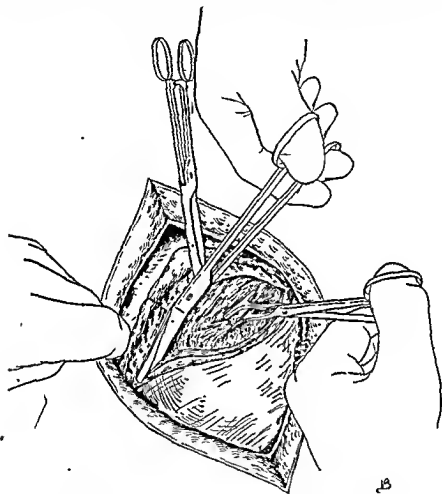


Fig. 321.—Enlarging the uterine incision to the left.

bleeding from the latter. He should now fix a volsellum on the lower edge of the uterine incision (Fig. 320).

viii. Completing the extraction of the head.—Still pulling on the scalp, the surgeon enlarges the incision right and left, slightly curving upwards, the assistants retracting the abdominal wall on either side to give him room (Figs. 321, 322). As soon as there is space enough, a second pair of Willett's forceps is placed on the scalp nearer to its vertex (Fig. 323) and, as this is pulled on and the incision further enlarged, a

third pair is applied still nearer the vertex with the object of rolling the head upwards. The traction on the head into the wound checks bleeding from its edges. Just before the head slips out, another volsellum is placed on the upper edge of the wound. Directly the head is delivered the scalp forceps are removed.

ix. *Extracting the body.*—The index finger now seeks one axilla and disengages the arm, and then the other arm in the same way, after which

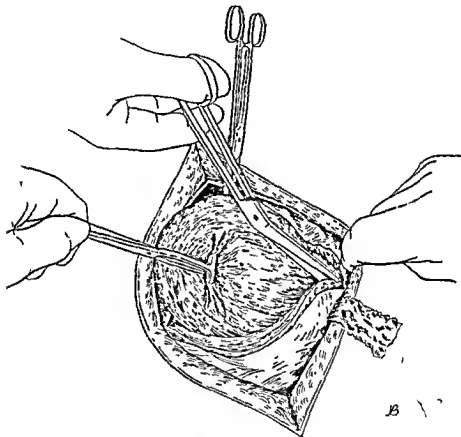


Fig. 322.—Enlarging the incision to the right.

the body is withdrawn and the child laid on the sterile sheet above the abdominal wound. During these manœuvres the two assistants hold the edges of the uterine wound up by the two volsella already affixed.

x. *Seizing the angles of the wound.*—Each angle of the uterine wound is now seized with a volsellum or scalp forceps and the assistants, taking two forceps each, hold the wound up so as to prevent liquor and blood running out of the uterus into the peritoneal cavity (Fig. 324).

xi. *Looking to the child.*—The surgeon feels the cord and, if the pulse is good, there is no hurry to separate the child. He inverts it by its feet, mops its mouth and encourages it to breathe. If it has already

ied he should separate it at once, as he should if the pulse be feeble and slow, when restorative measures must be applied without delay.

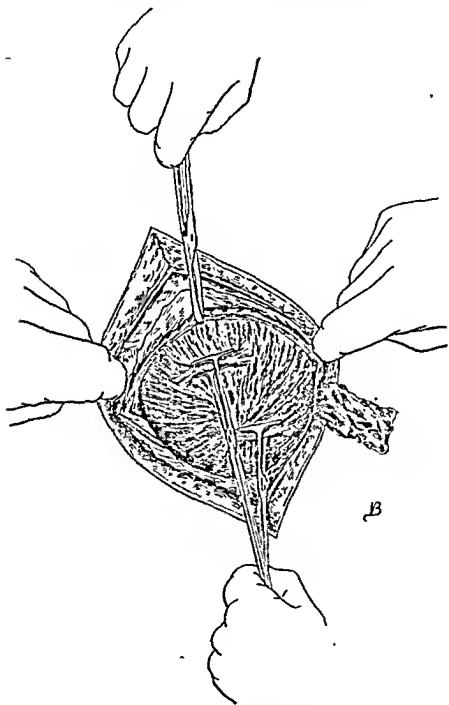


Fig. 323.—Extracting the head.

xii. Mopping out the uterus.—The amniotic cavity should now be mopped dry with a swab, the assistants continuing to hold the wound up.

xiii. Placing sutures on the angles of the wound.—Before he removes the placenta, the surgeon inserts two interrupted catgut sutures at each angle of the uterine wound, replacing the forceps previously placed

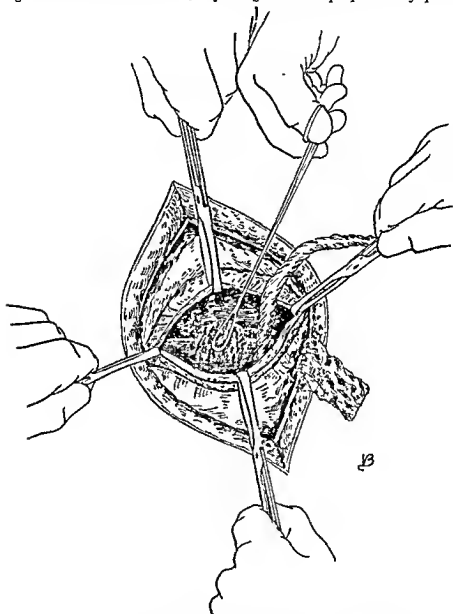


Fig. 324.—Mopping out the liquor amnii while the incision is held by the four volsella.

there. These sutures should not be tied but used to hold up the angles in place of the forceps (Fig. 325).

xiv. Removing the placenta.—Having satisfied himself that the ergometrine has taken effect, the surgeon begins by separating the

membranes off the lower pole of the uterine cavity, after which, with the fingers of his right hand, he separates and removes the placenta (Fig. 326). A certain amount of bleeding follows on this; it is best controlled by suturing the incision as quickly as possible.

xv. Suturing the uterus.—The sutures already inserted are now tied;

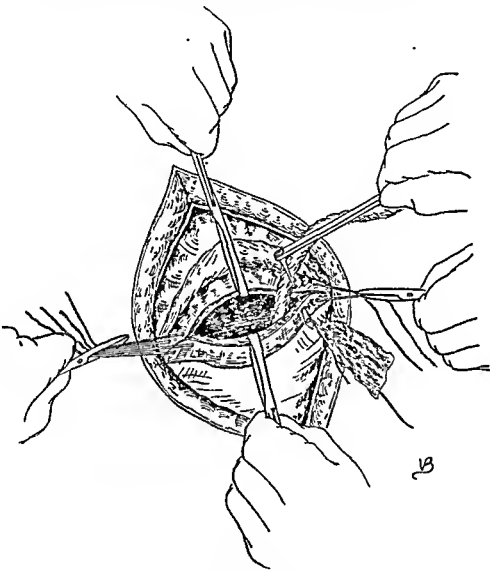


Fig. 325.—Inserting the lateral sutures.

and the intervening space is closed by a series of interrupted catgut sutures, which may be reinforced by a couple of mattress sutures. All these sutures just miss the endometrium (Fig. 327).

xvi. Suturing the flap.—The peritoneal flap is now fixed by a continuous catgut suture to the uterine wall above the line of the uterine incision (Fig. 328).

xvii. Peritoneal toilet.—Blood or liquor that has escaped is mopped out and the gauze packing withdrawn.

xviii. Closing the abdominal wound.—See p. 286.

xix. Emptying the vagina.—This is a very important step in the operation for, if the patient be returned to bed with her vagina full of

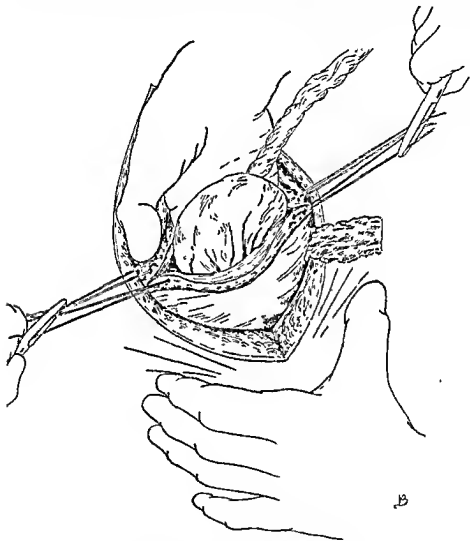


Fig. 326.—Extracting the placenta.

blood, not only is retraction interfered with, but when the vagina presently empties itself the blood will be mistaken for post-partum hæmorrhage. The patient's legs should be held up while the surgeon liberally souses the vagina with Violet-green to counter infection, and clears out the passage. If the cervix be closed, he should force his finger through it and make certain there is no clot in the lower segment. There is no danger in doing this if the finger be covered with Violet-green.

Difficulties and dangers.—The operation is technically more difficult than the classical operation but the results are better. If carried out in the manner described, there should be little bleeding until the placenta is separated, and not then if the ergometrine has acted. If necessary, a second injection can be given, preferably by the intravenous route. There is no advantage in injecting it into the uterus. Without the compressor, bleeding from the transverse incision may be very free, for large

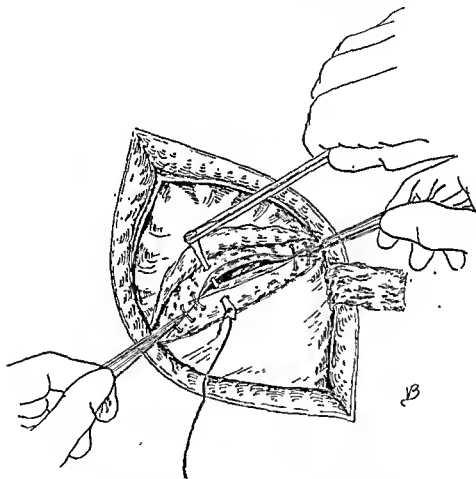


Fig. 327.—Completing the suture of the incision in the uterus.

vertically-running sinuses are often present. If scalp forceps are not used to extract the bead the hæmostasis produced by pulling on them will also be wanting. These remarks apply chiefly to the operation when carried out before labour. When labour has commenced, and especially when it has been in progress some time, the lower segment is much less vascular and much more retractile.

The scalp forceps make small marks which rapidly disappear. Sometimes a fluctuating swelling forms under the mark, but it gives

no trouble and soon absorbs. It is important that the assistants continue to hold the incision up without relaxation, for not only does this prevent blood and liquor from getting into the peritoneal cavity but the tension on the wound edges checks oozing.

The operation is equally applicable to breech presentations, for the thick skin of the buttocks affords an admirable hold for the scalp forceps. Further, it is excellent for cases of placenta prævia; and, if the placenta

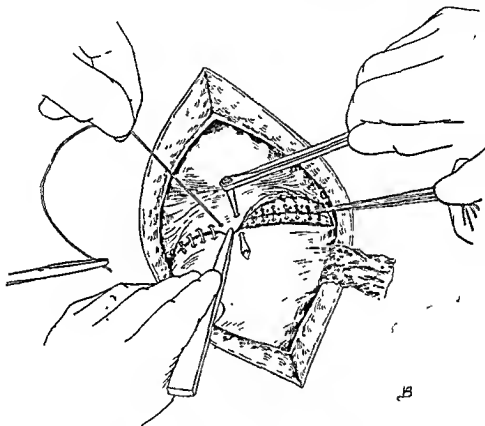


Fig. 328.—Suture of the peritoneal flap.

has to be cut through, first the compressor and afterwards the pressure of the head stops bleeding.

Although the lower-segment operation was originally applied only to cases in labour, we have, since we invented the technique just described, performed the operation in all cases irrespective of whether they were or were not in labour, in preference to the older operation.

Sometimes it will be found more convenient to incise the uterus slightly above the line along which the peritoneal flap was reflected, i.e., through the fixed peritoneum. There is no objection to this, for the flap can easily be pulled up and sutured above it.

Dangers. i. Injury to the bladder.—Since the incision is so low, the bladder might be opened, supposing the surgeon failed to distinguish the limits of this viscus. With due precaution this should be a very unlikely event.

ii. Unduly enlarging the uterine incision.—If the incision extends too far round the uterus, the uterine vessels will be opened, resulting in profuse bleeding. The most likely manner for this to occur is by tearing the uterus when the head is being extracted. This is a very real danger if the head be extracted with the midwifery forceps or prized out with the hand. The use of Willett's forceps, as first advocated by one of us, practically obviates this complication, since the incision is never more than just sufficient to allow the head to escape.

iii. Hæmorrhage.—An incision through the lower segment may be almost bloodless, especially if the patient is in labour. On the other hand very free hæmorrhage may occur from it, and such bleeding is not only dangerous to the patient and disturbing to the surgeon, but it so obscures his view that he has difficulty in seeing what he is doing and he is very likely to cut the child's scalp. If the uterine compressor is used in the manner described, there is practically no bleeding until after the child is extracted, when blood may escape from the uterine incision, from the placental site or both. Bleeding from the incision is always controlled as soon as the sutures are tied, so that time should not be lost in doing this. Bleeding from the placental site is discussed on p. 481.

iv. Cutting the head of the child.—The head of the child can easily be cut when the uterine incision is being made. The use of the compressor prevents this because it keeps the field clear of blood.

Remarks.—When sepsis is either patent or suspected, measures may be taken to cut off the operation area from the general peritoneal cavity. This is effected by turning upwards a peritoneal flap from off the lower segment of the uterus and suturing it to the parietal peritoneum. In our experience such an exclusion is a difficult thing to accomplish efficiently, since during the extraction of the child the peritoneal partition usually tears in one or more places. Some surgeons commence the operation by separating the bladder as far down as possible so as to make the transverse incision at a low limit. We do not see any advantage in this procedure, except in those cases in which the head of the child has already been forced into the pelvis by labour pains and cannot be got out of it either by gravity (tilting the table) or by pushing it up from the vagina. In such a case the bladder must be turned back if the incision is to be made over the head. It is questionable, to our minds, whether it is justifiable to perform a

Cæsarean section in a case of obstructed labour so far advanced since, apart from the risk of sepsis, the child will either be dying or dead. For septic or suspected septic cases we think the best technique is that described on p. 484.

CLASSICAL CÆSAREAN SECTION

The classical operation is simpler than any other method and can be performed in far less time. Its drawbacks are that the child is extracted breech first by a species of version and may suffer in consequence, that the uterine scar is very apt to adhere to the abdominal wall, and that because the incision in the uterus is placed much higher than in the lower segment operation and the uterus is often subsequently everted, the area of the intestines is invaded, and the postoperative distension, with its resulting discomforts and dangers, is more likely.

Preparation of the patient.—See p. 78.

Position of the patient.—A slight degree of tilt is an advantage in that it prevents the intestines prolapsing through the wound.

Instruments.—See p. 274.

Ergometrine.—Immediately before opening the abdomen 1 c.c. of ergometrine should be injected intramuscularly, or, better still, intravenously, so as to ensure good retraction of the uterus.

Operation. i. Opening the abdominal cavity.—See p. 286. The upper limit of the incision should not reach above the umbilicus. It is well to remember that, in cases in which Cæsarean section is necessary, the bladder will very often be dragged high up into the abdomen, so that there is great danger of wounding it if the incision is not made carefully.

The skin-incision need not exceed 4 inches in length.

Some surgeons, before opening the uterus, deliver it through the abdominal wound. We do not follow this method except when the uterine contents are septic (see p. 484).

ii. Opening the uterus.—The uterus, which may have rotated, is so manipulated that the centre of its anterior surface corresponds with the line of the abdominal wound. Gauze soaked in saline solution is now packed around the area on the front of the uterus through which it is intended to incise. If this precaution be not taken blood will run into the upper abdomen and flanks, and need removal before the abdominal wound is closed. We have seen several cases in which blood

overlooked in these positions has caused local peritonitis, and, in one case, intestinal obstruction (Fig. 329).

An incision of about 4 inches is then rapidly made through the anterior surface of the uterus in the middle line. This incision is commonly made through the upper segment of the uterus because of

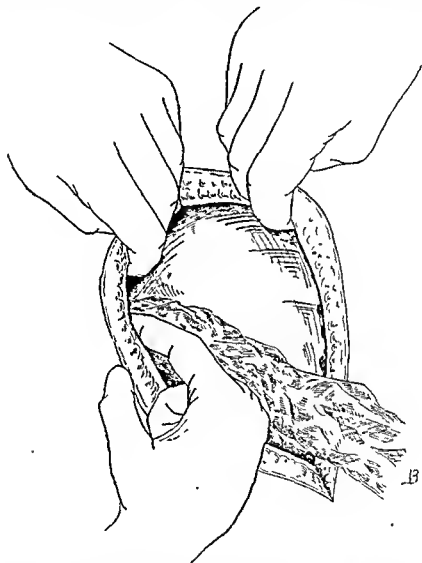


Fig. 329.—Classical Cæsarean section: Packing gauze round the uterus.

the more vigorous retractility of this portion of its wall. In some cases the parietal incision described will allow of this being easily done, but in others, and especially in those in which there is an excessive amount of liquor amnii, or when the head is high out of the pelvis, most of the upper segment will be above the superior limit of the parietal incision. In this event, access to the desired site for the uterine incision may be effected by the assistant and the surgeon lifting the upper edges

of the parietal wound upwards and outwards, as shown in Fig. 330. This is better than extending the incision above the umbilicus, since it prevents extrusion of the bowel when the uterus is delivered through the

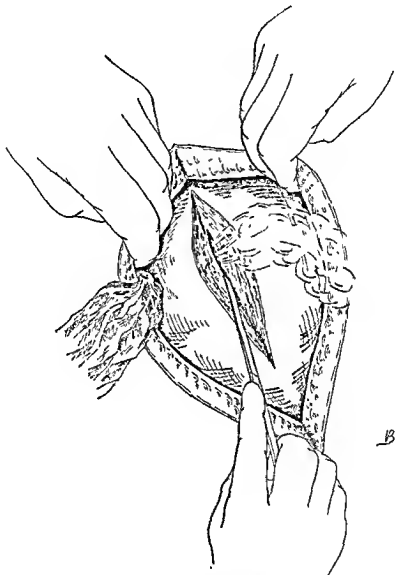


Fig. 330.—Incising the uterus.

abdominal wound. If, however, additional room is required, the incision may be extended, if necessary, into the lower uterine segment, the surgeon slipping the first and second fingers of his left hand into the uterine cavity (Fig. 331). The uterine wall being divided, the membranes, if not already incised, are ruptured.

The operator must be careful not to injure the child with the scalpel as he is incising the uterus.

At times the bleeding is very free when the muscle-wall is being cut through, more especially if the placenta happens to be attached to the anterior wall, but no notice should be taken of the bleeding. If the placenta is in the way it should either be cut through or rapidly displaced with the hand. After the delivery of the child the bleeding is, as a rule, arrested by uterine retraction.

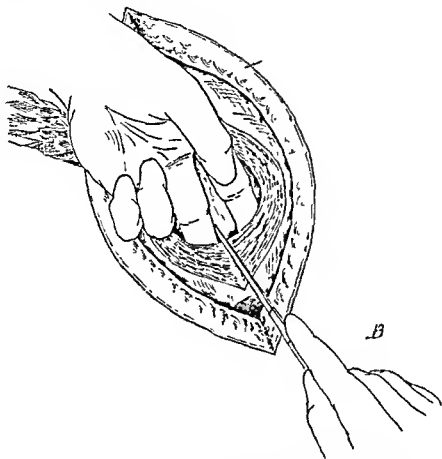


Fig. 331.—Extending the incision of the uterus downwards.

iii. Delivery of the child.—The body is delivered by traction on a leg (Fig. 332), and the head manipulated out; the umbilical cord is then clamped in two places with pressure forceps and cut between them so that the child is freed. In cases in which profuse hæmorrhage ensues, as, for instance, when the placenta is on the anterior wall, the cord must be at once clamped and divided, otherwise it is better to encourage the child to breathe first.

iv. Delivery of the uterus.—After the child is removed the retracted uterus is delivered through the abdominal incision by passing the

index and middle fingers into its cavity and hooking it forwards, aided, if necessary, by the fingers of the left hand behind the uterus (Fig. 333). If the extent of the abdominal incision has been rightly

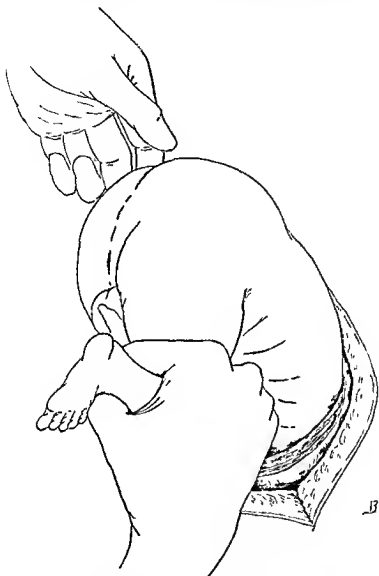


Fig. 332.—Delivering the body of the child.

judged, a swab to pack off the intestines is not required. If the incision is too large, a swab must be inserted for this purpose.

v. Removal of the placenta.—The placenta and membranes are now removed by hand (Fig. 334). Care must be taken to ensure that all the membranes have been removed. If the membranes have not

ruptured before the operation, the appearance of the lower pole of the bag will show that they have been removed whole.

vi. Suturing the uterus.—The wound in the uterus is now to be closed. This is effected by passing three or four mattress-sutures deeply penetrating the uterine wall, through the peritoneum and muscle on either side, but *not* through the mucous membrane. Directly these are tied most of the bleeding from the edges of the uterine wound ceases (Fig. 335).

These mattress-sutures must be of stout material, for the tension

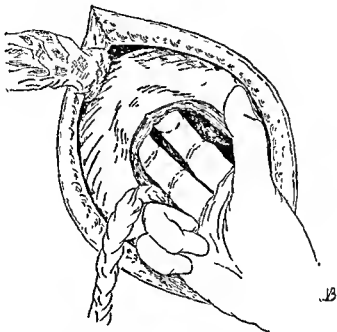


Fig. 333.—Eventrating the uterus.

is considerable. No. 6 silk is the best to use. Silk is preferable to catgut for these sutures. A continuous No. 2 20-day catgut suture is then inserted to approximate the edges of the uterine wound which have been everted by the mattress-sutures (Fig. 336).

An alternative method is to close the whole wound by interrupted sutures. Of these, about eight pass through the whole thickness of the uterine wall except the endometrium, while the remainder, passed less deeply, approximate any gaps which may exist between the deeper sutures.

vii. Peritoneal toilet.—The gauze packing is withdrawn, and blood or liquor amnii which may have escaped into Douglas's pouch is removed with a swab, after which the uterus is returned into the abdomen.

viii. Closing the abdominal cavity.—See p. 286.

ix. Emptying the vagina.—The vagina is now emptied of blood and clot in the manner detailed on p. 470.

Difficulties and dangers. i. Delivering the child.—If labour has



Fig. 334.—Removing the placenta and membranes.

commenced and the uterus is contracting strongly, there may be considerable difficulty in delivering the child, and the incision in the uterus may have to be lengthened.

If the head of the child has partly entered the brim of the pelvis,

some difficulty may be experienced in extracting it. Under these conditions the uterine incision may have to be enlarged and the head disengaged, perhaps by jaw-traction, while an assistant forces it up by vaginal manipulation.

If the head is impacted in the pelvis, Cæsarean section, unless absolutely necessary from inability to deliver the child by any other method, should never be performed, as in the first place the child will certainly be dead by the time it is delivered, and secondly, the uterus may be so injured in the process of delivery that it must be removed.

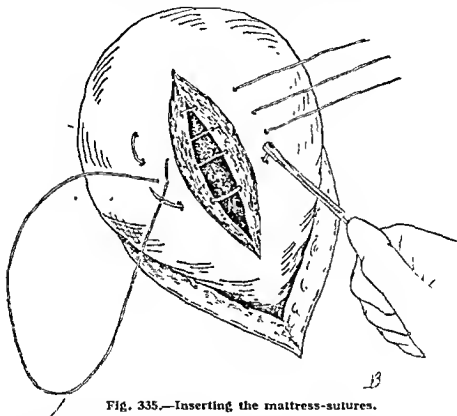


Fig. 335.—Inserting the mattress-sutures.

Before now it has been found necessary to perforate the head to allow the child to be extracted from the brim.

ii. *Hæmorrhage*.—In most cases all bleeding from the cut uterine wall ceases as the organ retracts, but a few spurting arteries may remain. *Hæmorrhage* from the wound-edges can always be controlled by the sutures which close the incision in the uterus, and if this is the only bleeding that is going on, they should immediately be inserted. In some cases, however, owing to deficient retraction, free bleeding occurs from the placental site. It is important to remember that retraction of the muscle is interfered with so long as the uterine wound is unclosed. Further, the uterus does not retract well so long as the organ is outside the abdomen. For these reasons the surgeon should not waste time

in trying to check bleeding from the placental site, but should at once proceed to suture the uterine wound and return the organ into the abdomen.

If after this it is found that the uterus is becoming relaxed and distended with blood, it should be massaged *in situ* and another 1 c. c. of ergometrine administered by intramuscular or, better still, by intravenous injection.

Severe postpartum hæmorrhage from the placental site will practically never occur if the uterus be treated in the manner advised,

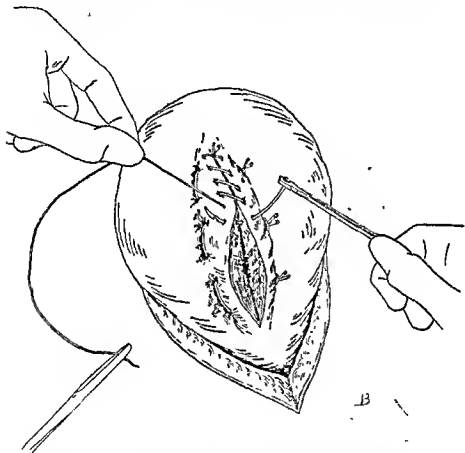


Fig. 336.—Inserting the continuous sutures.

but it is otherwise if the surgeon nervously wastes time in applying hot sponges and compression to the everted and unsutured organ.

In those rare cases in which the bleeding cannot be controlled by these means, such as when the operation is being performed for concealed accidental hæmorrhage, the uterus must be amputated by the method described at p. 301.

iii. Sepsis.—The danger of Cæsarean section is concerned almost entirely with the question of sepsis. If the patient is not in labour, or only in early labour and there is ample time to prepare her and her

surroundings, and the operation is performed by one who is accustomed to obstetric surgery, it is a very safe one. If, however, the membranes have been ruptured for a long time, or the fingers, hand, or any instrument have been passed into the uterus while making ineffectual attempts at delivery with the forceps or by version, the uterus in all probability is infected. Again, if the patient has any septic condition of the genital passages, or if they are bruised, torn or swollen, the risk of infection is enormously increased.

The operator must use his judgment in such cases, but at times, in spite of the fact that infection of the uterus has already taken place, Cæsarean section may be the only procedure available for delivering the child. In such cases it may be wise to remove the uterus as well. Alternatively, such cases have been successfully dealt with by swabbing the inside of the uterus and the vagina with Violet-green, and this should always be done when there is any suspicion that infection may have occurred. The introduction of penicillin and the sulphonamides will certainly reduce the number of necessitous hysterectomies.

Sepsis of the uterine wound is apt to be followed by a very troublesome sinus or sinuses leading down to the sutures in the uterus. These sinuses discharge blood at each monthly period, the blood apparently coming from the granulation tissue, which may be seen to become greatly congested. Infected sutures may eventually be discharged *via* the vagina, or have to be operatively removed, pending either of which occurrences there is a constant discharge of pus and blood.

iv. Rupture of the uterus through the old scar during a subsequent pregnancy or labour.—This is a possible danger which has to be mentioned. We have only once met with the complication in a case on which we had previously operated, although we have performed Cæsarean section many times twice, sometimes thrice, and once seven times, on the same patient. A large number of cases of rupture have been collected, but in practically all of them the uterine incision had been closed with catgut or the operation had been followed by suppuration both of the uterine and abdominal wounds, so that the scars of both were weak. Therefore, when a natural labour follows a Cæsarean section, the obstetrician should bear in mind the possibility of rupture.

After-treatment.—See p. 24 and Chapter XXIX. The mother should suckle her child unless there is some contra-indication.

Should the patient be sterilized?—This depends upon the condition for which the operation is performed. If the operation is necessary because of obstruction due to a tumour of the uterus, this organ may have to be removed by hysterectomy after the child has been delivered, if the tumour cannot be enucleated. If the operation is performed for chronic disease the patient should be sterilized; if for carcinoma of the cervix, the radical operation should be performed. If Cæsarean section is necessary for accidental hæmorrhage, it is advisable to remove the

uterus, unless firm retraction can be secured, rendering postpartum hæmorrhage unlikely. Hysterectomy is nearly always necessary in concealed accidental hæmorrhage. In cases of placenta prævia in which it is necessary to perform Cæsarean section, the uterus can be conserved. In both these conditions and also when the operation is performed for malpresentation apart from contracted pelvis the patient need not be sterilized.

When the operation is performed for contracted pelvis, the question of sterilization requires most careful consideration. From the national standpoint, sterilization may be the means of depriving the community of useful citizens; from the domestic point of view, the life of the Cæsarean child obtains thereby an additional importance, as no other children are possible to the woman; from the point of view of the interests of the patient herself, the sterility thus acquired may, in the case of a widow or an unmarried girl, be a serious handicap to the chance of future marriage. The risk of Cæsarean section is not increased by the repetition of its performance, while, on the other hand, sterilization has the advantage of removing the menace from a deformity which, in itself, is a misfortune.

We are of opinion that the *pros* and *cons* for sterilization should be fully explained to the patient and her husband, and the decision left to them. If they do not express a distinct wish in the matter and the choice is left to the operator, he should decide against sterilization, since, if the domestic aspect of its performance be indifferent to the husband and wife, it behoves him to have regard to the interests of the community at large.

If, on the other hand, the patient and her husband wish to avoid the possible repetition of the operation, the woman should be sterilized, but the operator should obtain leave to omit this step if the child is born dead, has some deformity, or appears unlikely to survive. In respect to this last point, it is of great importance that the child should be very carefully examined directly it is born. The rectum in particular should be investigated, since cases of imperforate anus are likely to be overlooked. The only efficient method of sterilization, apart from removal of the uterus, is to remove the outer halves or the whole of the Fallopian tubes, such procedures as simple ligature or division between ligatures having failed on occasions. The technique of partial salpingectomy is described at p. 685; and that of total salpingectomy on p. 660. We ourselves always prefer the sub-total operation.

LOWER SEGMENT CÆSAREAN SECTION WITH EVENTRATION OF THE UTERUS

In cases in which grave infection is obviously present the best way to minimize the risk of peritonitis subsequent to the operation is to

eventrate the uterus before opening it. The technique now to be described is that employed by our late colleague, J. Ellison.

Operation. i. **Abdominal incision.**—This should be about 8 inches long, half above and half below the umbilicus.

ii. **Eventrating the uterus.**—By making pressure through the

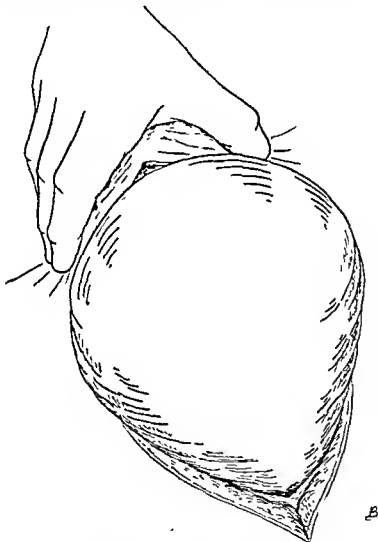


Fig. 337.—Lower segment Cæsarean section with eventration first:
Eventrating the uterus by pressure.

abdominal wall on the top and sides of the uterus, the organ is easily delivered (Fig. 337).

iii. **Packing off the intestines.**—A large swab or towel wrung out of saline solution is required.

iv. **Reflecting the peritoneal flap.**—The peritoneum covering the lower segment is now incised transversely at the junction of the fixed and movable portions and a flap is turned down carrying with it the bladder

for a distance sufficient to uncover fully the area beneath which the head is lying (Fig. 338).

v. **Incising the uterus and expressing the head.**—A medium incision is now made over the head, which is kept pressed against the anterior uterine wall by the left hand grasping it and the lower segment from behind. The pressure of the head prevents bleeding from the incision,

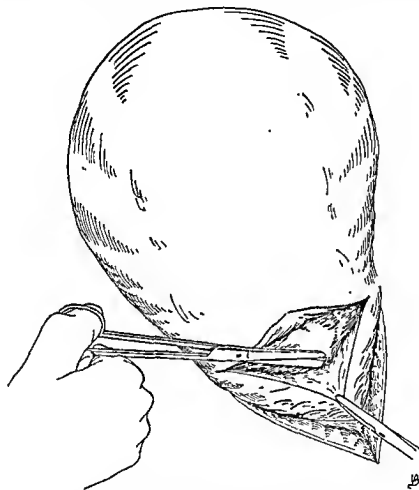


Fig. 338.—Reflecting the peritoneal flap.

and when the latter has been extended sufficiently the head is squeezed out of the uterus (Fig. 339).

vi. **Delivering the child and placenta.**—The body of the child is now withdrawn and the placenta then delivered by expression.

vii. **Suture of the uterine wall.**—The incision in the uterus is then closed by a continuous catgut suture, No. 1 20-day, reinforced by three or four mattress-sutures of the same material (Fig. 340).

viii. **Replacement of the flap.**—The peritoneal flap is now sewn back with a continuous suture. If the uterine incision has had to be extended

upwards into the area of fixed peritoneum, the flap should be pulled up and sutured so as completely to cover it.

ix. Returning the uterus and closing the abdominal wound.—See p. 286.

Difficulties and dangers.—Those already discussed (pp. 473, 480). We prefer not to eviscerate the uterus except in gravely infected cases.

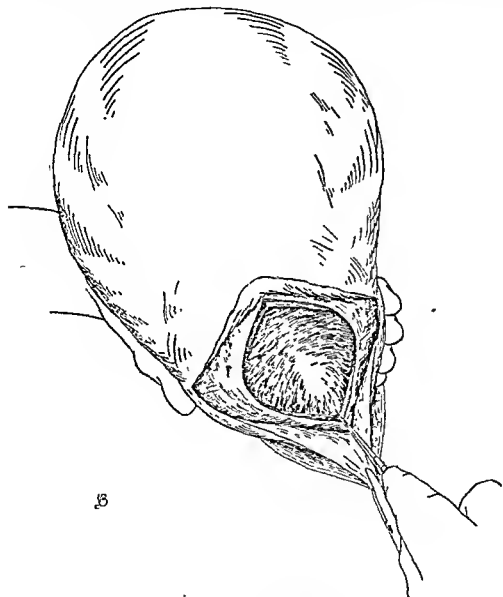


Fig. 339.—Delivering the head.

holding that it tends to increase the operative trauma. The extent to which it does so is not, however, as great as would be expected. It has the advantage that neither blood nor liquor amnii find their way into the peritoneal cavity if the uterus, prior to its incision, be well wrapped round with towels wrung out of saline solution.

for a distance sufficient to uncover fully the area beneath which the head is lying (Fig. 338).

v. **Incising the uterus and expressing the head.**—A medium incision is now made over the head, which is kept pressed against the anterior uterine wall by the left hand grasping it and the lower segment from behind. The pressure of the head prevents bleeding from the incision,

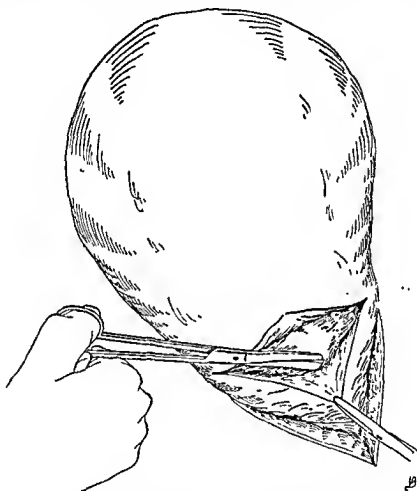


Fig. 338.—Reflecting the peritoneal flap.

and when the latter has been extended sufficiently the head is squeezed out of the uterus (Fig. 339).

vi. **Delivering the child and placenta.**—The body of the child is now withdrawn and the placenta then delivered by expression.

vii. **Suture of the uterine wall.**—The incision in the uterus is then closed by a continuous catgut suture, No. 1 20-day, reinforced by three or four mattress-sutures of the same material (Fig. 340).

viii. **Replacement of the flap.**—The peritoneal flap is now sewn back with a continuous suture. If the uterine incision has had to be extended

impossible. Cases of exophthalmic goitre in pregnancy may require similar treatment.

Much rarer than these three instances are those cases in which pregnancy is habitually followed by some dangerous disturbance of the economy, as for instance by nephritis, diabetes, hæmolytic anæmia, or insanity. In all these cases evacuation of the uterus should be combined with a sterilizing operation. Finally, cases of physical deformity incompatible with continued pregnancy are sometimes met with, such as extreme kyphosis.

The older course in all these cases was first to evacuate the uterus through the cervix or to induce abortion, and then to open the abdomen and ligature or remove the Fallopian tubes. We have abandoned this practice for many years, believing it to be faulty, more especially if the pregnancy has advanced beyond the 3rd month.

ii. *When the pregnancy has advanced to the fourth month or over and its termination is urgent.*—The evacuation through the cervix of a pregnancy of 4 to 6 months' standing is a formidable operation. The extraction of a head of even 4 months' growth needs a degree of cervical dilatation which almost always badly splits the cervix. At 5 or 6 months, sufficient dilatation cannot be obtained even by deep splitting, and the surgeon is obliged to incise the lower pole of the uterus along its anterior wall from the external os upward to the peritoneal reflectjon—i.e. vaginal Cæsarean section.

Vaginal Cæsarean section is an operation of definite difficulty, particularly in women who have not previously borne children; but its greatest drawback is that it inflicts a wound in the uterus through a passage (the vagina) which cannot with certainty be rendered initially sterile, and certainly not kept sterile during an operation of some duration.

For these reasons we have for a long time adopted the abdominal route when it is necessary to remove a pregnancy of 4, 5, or 6 months' standing, as, for instance, in cases of gastro-hepatic or cerebro-renal toxæmia (pernicious vomiting and eclamptic nephritis), or other gravely menacing complications of pregnancy.

iii. *Vesicular mole.*—In our opinion in most cases in which there is a vesicular mole, it should be removed by the abdominal route. The vaginal operation is a prolonged and difficult one and accompanied by more or less severe hæmorrhage. Moreover, there is a considerable risk of leaving portions of the mole behind or of perforating the wall of the uterus.

iv. In certain cases of uterine myoma complicated by early pregnancy.—The treatment proper for such cases will be found described at p. 406.

The operation.—The technique is that of the classical abdominal Cæsarean section (*see* p. 445). The uterine incision needed is of course much smaller, the bleeding is less, and fewer sutures are required to close

the hole and staunch the blood-flow. We use interrupted catgut, No. 2, sutures and pass them just short of the endometrium. One ampoule of ergometrine should be given intravenously just before the abdomen is opened. The incision should always be made through the *anterior wall*, for the reasons given at p. 395.

Postoperative dangers.—Bleeding from the uterine incision or needle punctures is dangerous, because the effused blood attracts coils of intestine to adhere to the uterus. Before deciding that oozing from these sites is really persistent, put the uterus back into its place and watch it for a minute or so. So long as it is outside the abdominal wound, the incision, or punctures, tend to bleed, because the venous return is interfered with by the traction on the broad ligaments and the nipping by the edges of the abdominal wound. In this regard the uterus is like the kidney pulled through a loin wound and, moreover, the uterus will not retract perfectly until it is returned to its proper place.

VAGINAL CÆSAREAN SECTION

As a means of artificial delivery, vaginal Cæsarean section is vastly inferior to abdominal Cæsarean section, being not only technically more difficult, but having the great disadvantage that the uterine section is performed through the vagina, the surface of which is far more difficult to sterilize than the abdominal skin, and still more difficult to maintain aseptic.

For these reasons we believe that its performance should be restricted to those cases in which the abdominal route is either impossible or strongly contra-indicated.

Thus an artificial anus, the result of colostomy, makes abdominal Cæsarean section dangerous, or even (if the opening be situated in the middle line below the umbilicus) impossible; ulceration of a large ventral hernia, such as is sometimes seen with pregnancy, a suppurating abdominal sinus, or acute eczema, or an extensive unhealed burn of the abdominal wall, are other conditions which would make abdominal Cæsarean section very hazardous.

It has been stated that the uterus can be emptied more quickly by vaginal than by abdominal Cæsarean section, but this is incorrect. If speed be an essential matter, the actual delivery can be carried out much more rapidly through the abdomen, while if the total duration of the two operations be compared, that by the abdomen is considerably the shorter. On an occasion of extreme urgency, one of us completed the entire abdominal operation in 6 minutes. It has further been claimed that there is less shock with the vaginal operation, and that it is therefore better suited for conditions in which the patient's general condition is very grave; but here again we believe that the advantage lies with the classical operation.

When the child is mature or nearly so, and the vagina has not been previously dilated by childbirth, vaginal Cæsarean section may be an exceeding difficult procedure, involving considerable risk of extensive laceration and severe hæmorrhage. We ourselves hold that, save under very exceptional conditions, it is not to be entertained when the pregnancy has advanced beyond the 32nd week, and, further, that it is not infrequently advisable in the mother's interests to perforate the

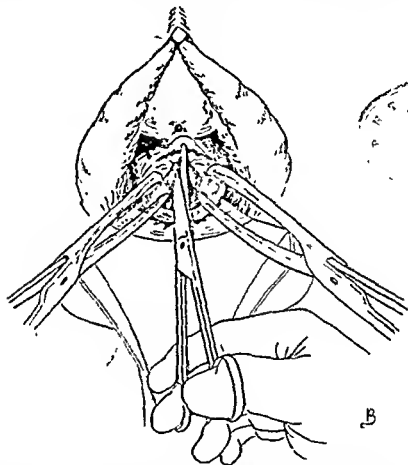


Fig. 341.—Vaginal Cæsarean section: Beginning the incision of the cervix.

head before pulling it through the aperture which has been made by incising the wall of the lower uterine segment.

Preparation of the patient.—The most essential point is to sterilize the vagina and its approaches as far as possible. For this purpose Violet-green (p. 31) is best employed.

One ampoule of ergometrine should be administered intravenously immediately before the operation begins.

Position on the table.—The lithotomy position.

Instruments required.—Auvard's speculum, a broad-bladed vaginal retractor, two scissors, dissecting forceps, six long Spencer Wells forceps,

two ring forceps, two volsella, midwifery forceps, perforator, cranioclast, four curved Bonney needles No. 7 and Reverdin's needle, No. 1 20-day catgut, Willett's scalp-forceps.

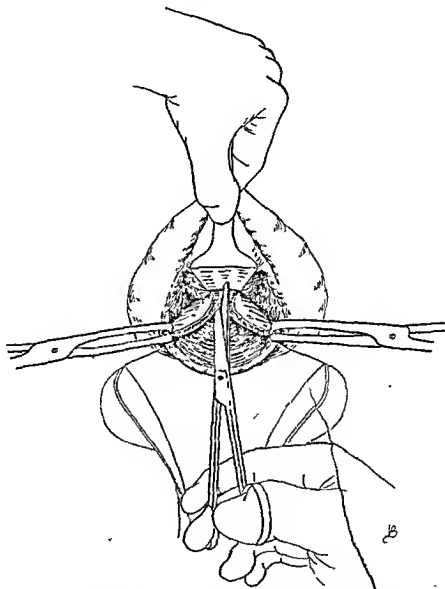


Fig. 342.—Continuing the incision into the lower segment.

The operation. i. **Detaching the bladder.**—Auvard's speculum is introduced and the cervix is pulled down either with ring forceps or with a volsellum. The broad-bladed vaginal retractor is now inserted so as to hold back the anterior vaginal wall, and the tissue at the junction of the anterior fornix with the cervix is picked up with dissecting

forceps and divided transversely for about an inch (Fig. 341). A pair of pressure forceps having been fixed to the anterior edge of this incision, the plane of cleavage between the bladder and the cervix is sought for with the index finger and, aided by snips with the scissors, the bladder is separated up to the peritoneum covering the floor of the utero-vesical pouch and pushed forwards.

ii. Incising the lower uterine segment.—A ring forceps or volsellum is now applied to the anterior cervical lip on either side of the middle

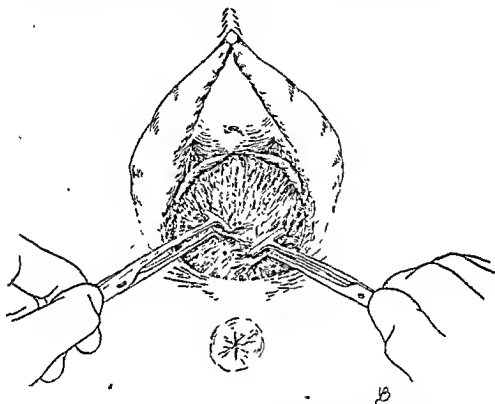


Fig. 343.—Extracting the head with Willelt's forceps.

line, and, one blade of a pair of scissors being passed up the cervical canal and the other up the space between the bladder and the cervix, the cervix and the lower uterine segment above it are incised up to the anterior peritoneal reflection (Fig. 342).

iii. Extracting the child.—The membranes are now ruptured, and the head (if presenting) is seized with midwifery or Willelt's forceps or (after perforation) with a cranioclast, and then extracted by steady pulling, the two ring forceps or volsella and the retractor having been previously removed (Fig. 343).

iv. Extracting the placenta.—The placenta is now delivered either by expression from the abdomen or by manual extraction through the incised cervix.

v. Suture of the uterus.—The two ring forceps or volsella being re-attached on either side of the cervical incision and the vaginal retractor being re-inserted, the cervix is pulled down, and the incision in it and the lower uterine segment is closed by catgut sutures, passed if possible so that the mucous membrane is not perforated (Fig. 344).

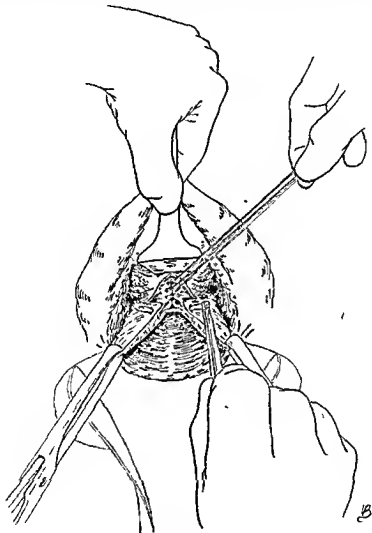


Fig. 344.—Suturing the cervix.

vi. Closure of the vaginal incision.—Finally, the transverse incision across the anterior vaginal vault is closed by a continuous catgut suture.

After-treatment.—Another 1 c.c. of ergometrine should be given directly the operation is finished. If the vagina has been thoroughly antisepticated beforehand, it is unnecessary to douche it for a week,

but douching after this is advisable, since there is often some discharge the sutures absorb or separate.

Difficulties and dangers.—With a capacious vagina, a small child and general laxity of the parts, the operation, so far as the extraction goes at all events, is simple, but this is not so when the reverse conditions exist. The chief operative danger is extensive splitting of the uterus during the extraction of the child, which is made the more likely the incision in the uterus has not been carried high enough. The bladder may be torn if the extraction be difficult. It is for this reason that it is better in the mother's interests to perforate the child's head. The bleeding from the incision is usually fairly free, and may be very profuse and continuous until the suturing of the uterus is complete. The suturing of the upper part of the incision may be very difficult if the passages are narrow, for it is situated high up and is difficult to see. The needle may have to be passed here by sense and touch.

There is a considerable risk of infection, because the suture line adjoins the vagina, and some fever and foul discharge are quite common during convalescence.

CHAPTER XX

HYSTEROTOMY, PLASTIC OPERATIONS ON THE UTERUS, AND SYMPATHECTOMY

HYSTEROTOMY

HYSTEROTOMY implies opening the uterine cavity by means of an incision through the uterine wall, and its classical rôle is seen in Cæsarean section. We also employ this method, not only as a means of emptying the pregnant uterus before viability and removing submucous myomata, but to explore the uterine cavity in certain cases of uterine hæmorrhage in young women in whom the cause of the bleeding is obscure. In such cases, on opening the uterus, small and previously unsuspected submucous myomata, either sessile or polypoid, may be found, or the presence of a mucous polypus may be disclosed, sometimes in a position (e.g. the uterine cornu) inaccessible to a curette applied from below, or even to a finger inserted through the cervix.

Most frequently of all, extreme thickening of the endometrium is found, in which case the whole of the mucosa can be erased absolutely down to the muscularis with a completeness impossible of attainment by a curette applied through the cervix. Indeed, nothing demonstrates better how very partial is the effect of curetting by the ordinary route than the examination of a thickened endometrium through a uterine incision, for it will at once be appreciated that it is impossible really to ablate the mucosa covering the fundus and cornua by a curette passed through the cervix.

Preparation of the patient.—See p. 78.

Instruments.—As for myomectomy, see p. 438.

Operation. i. Opening the abdominal cavity.—See p. 274.

ii. Incising the uterus.—A ring forceps is applied to the upper part of the broad ligament on either side, outside the ovary, so as temporarily to control the ovarian arteries, and the myomectomy clamp to control the uterine vessels. The uterus is then opened with a scalpel along its anterior wall in the middle line downwards nearly as far as the internal os, that is to say, nearly as far as the limit of the movable peritoneum on the front of the uterus (Fig. 345).

iii. Inspection and exploration of the cavity.—The cavity is now inspected and explored with the finger, particular attention being paid to the cornua, lest a polypus there escape notice.

iv. Erasion of the mucosa or removal of a polypus or submucous myoma.—

HYSTEROTOMY

It may be that a sessile myoma or polypus or some growth will be found to account for the symptoms. In either is removed by cutting or by enucleation. In many instances n but extreme thickening of the mucous membrane will be fou which event it must be erased.

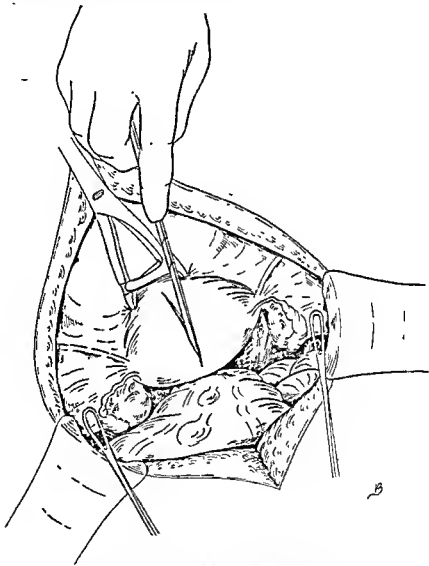


Fig. 345.—Hysterotomy : Incising the uterus.

A very convenient instrument for this purpose is the end o handle of a scalpel, which most effectively scrapes off the mucosa down to the muscularis. For the cornua a small sharp scoop sl be used (Fig. 346). The uterine incision is held open by volsella v. Suture of the uterus.—The operator introduces a series of su of No. 1 20-day catgut, passing deeply through the uterine wa either side of the incision, but just missing the cavity (Fig. 34

The ring forceps and myomectomy clamp are now removed, and any bleeding from the line of the uterine incision is arrested by under-running the point with a suture.

vi. Closing the abdominal cavity.—See p. 286. Before this is done, if the uterus is retroverted it should be fixed in the forward position either by ventralfixation or by shortening the round ligaments.

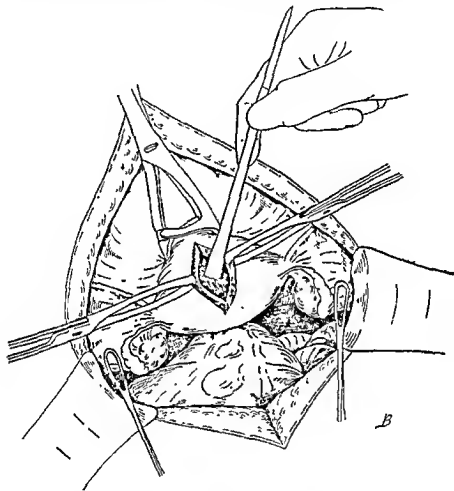


Fig. 346.—Abdominal curettage.

vii. After-treatment.—See p. 24 and Chapter xxx.

Difficulties and dangers.—The operation should never be undertaken in the presence of sepsis. If the uterus is much enlarged, subtotal hysterectomy, or in some cases utriculoplasty, is to be preferred. Marked degeneration of the uterine wall indicates hysterectomy.

The principal danger after hysterotomy, for whatever condition it is carried out, is the chance of oozing from the uterine wound into the abdominal cavity after the parietal wound has been closed. Such

oozing is usually followed by abnormal pyrexia during convalescence, and may produce intestinal adhesions, with risk of obstruction. The incision in the uterus should always be through its anterior wall, for the reasons given at p. 424.

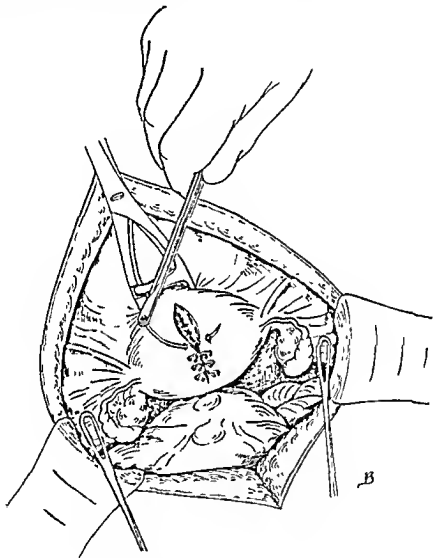


Fig. 347.—Suturing the uterine incision.

UTRICULOPLASTY

Apart from its reproductive significance it is doubtful whether the monthly flow serves any useful purpose, for it is quite certain that the total absence of menstruation is compatible with perfect health, and even in normal women its presence is always attended with discomfort and often with some degree of pain.

In exceptional cases, when a young woman suffers from intractable

and serious hæmorrhage not associated with a myoma or other tumour of the uterus, and in addition has a strong objection on the score of sentiment to the arrest of menstruation, or is very anxious to bear children, the operation to which we have applied the term *utriculoplasty* is an alternative to subtotal hysterectomy.* The operation, first described by Kelly, aims at the formation of a utriculus, which while preserving sufficient of the corporeal endometrium to allow of menstruation and pregnancy, is not large enough to permit excessive loss. We have performed this operation a number of times, and in certain cases with permanent success. In other of the patients, however, the excessive bleeding returned after a shorter or longer interval, and we had subsequently to remove the uterus. In view of this result we do not advise utriculoplasty except in cases in which conservation of the uterus is so especially to be desired as to make it worth while for the patient to take the risk of having eventually to undergo a further operation.

In regard to the possibility of pregnancy in the reduced uterus, we may add that the first patient upon whom we performed this operation became pregnant 6 months afterwards. The pregnancy proceeded normally until the 7th month, when labour was induced. The child was born alive and survived, the patient making a good recovery, and she subsequently bore two other living children, the last at term. In another case the patient went to term and was safely and easily delivered of a healthy child, weighing 7½ pounds.

These cases show that the diminished uterus is still capable of physiological hypertrophy, and that the risks attending future pregnancy, which might appear formidable, are not so serious as to make it proper to sterilize the patient by resecting the Fallopian tubes when performing the utriculoplasty. Such sterilization, indeed, would deprive the operation of half its value, and would give it but a sentimental value over subtotal hysterectomy.

Just as the pregnant uterus may rupture at the cicatrix of an old Cæsarean wound, so rupture after utriculoplasty is a possibility, but has not occurred in any of our patients who became pregnant.

It would be wise, however, to let a year elapse before permitting the chance of pregnancy, and if pregnancy occurs the patient should be kept under observation.

Preparation of the patient.—See p. 78.

Instruments.—As for myomectomy (see p. 438).

Operation. *i.* Opening the abdominal cavity.—See p. 274.

ii. Clamping the ovarian and uterine vessels.—The ovarian vessels are clamped by the application of ring forceps on the upper part of

* Victor Bonney "A Case of Utricaloplasty." *Arch of Middlesex Hosp.*, 1910, Vol. XVIII.

each broad ligament, and the uterine vessels by the application of the myomectomy clamp.

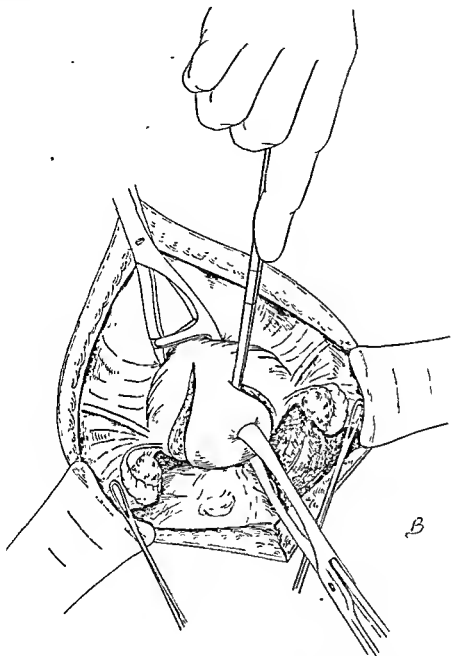


Fig. 348.—Utriculoplasty: Excising the wedge.

iii. Removal of portion of the uterus.—The area of contemplated excision should first be marked out with the point of the scalpel, and should extend above so as to include the entire fundus as far out on either side as a third of an inch from the tubo-uterine junction. A wedge-shaped piece of the uterus is then removed as indicated in

Fig. 348, having its base at the fundus and its apex at the internal os. The part resected includes the mucous membrane, but leaves a portion thereof on either side of the V-shaped area of excision.

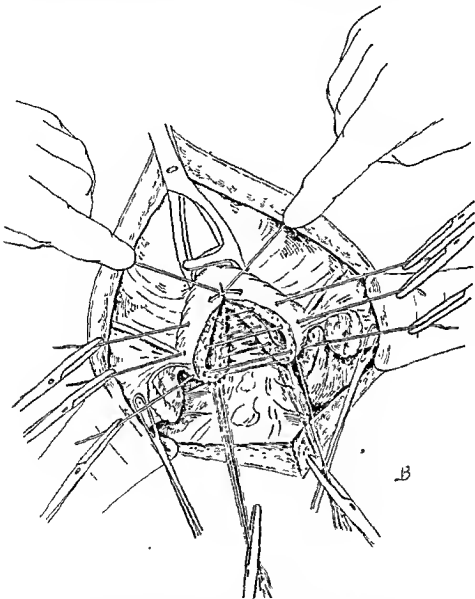


Fig. 349.—Suturing the reduced halves of the uterus.

iv. *Reconstructing the uterus.*—The sutures (catgut No. 1), are passed through the peritoneal and muscular coats, but not through the endometrium, and tied. Those sutures in front unite the cut edges of the anterior wall of the uterus, and those behind, the posterior wall (Fig. 349).

The ring forceps and myomectomy clamp are then removed, and if there is any troublesome oozing from the suture lines, additional interrupted sutures of catgut are inserted.

Dangers.—The bleeding in all our cases has been at once checked by the sutures. Exceptionally it might be difficult to control, in which case a hysterectomy would be necessary. As the sutured surface

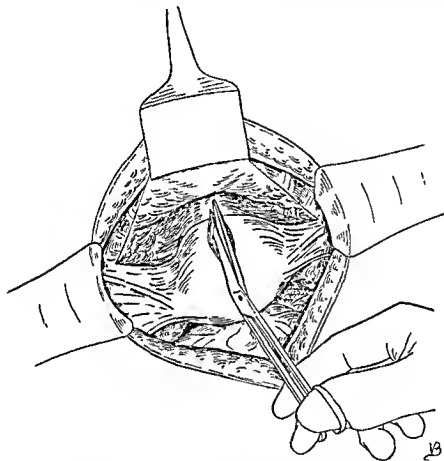


Fig. 350.—Incision of the cervix by the abdominal route :
Incising the cervix.

is large the strictest asepsis is imperative. The suture lines are potential sites of adhesion.

Dressing and after-treatment.—See p. 24 and Chapter xxx.

Alternative method.—When the uterine tissue is soft, it is possible to remove a large proportion of the endometrium by excising the anterior wall of the uterus only, and then suturing the cut edges. This method has the advantage that the suture line lies entirely in front of the uterus, and the risk of intestinal adhesion is minimized.

ABDOMINAL SPLITTING OF THE CERVIX FOR DYSMENORRHŒA

In certain cases of intractable dysmenorrhœa, relief has been obtained by enlarging the cervical canal by splitting it. The operation can be performed by the vaginal route as was advocated by the late Blair Bell. We ourselves prefer the abdominal route.

Preparation of the patient.—See p. 78.

Instruments.—See p. 274.

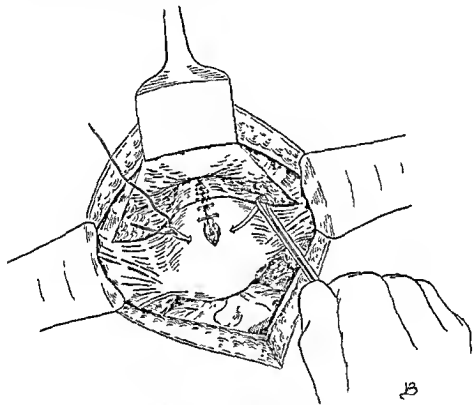


Fig. 351.—Suturing the cervix.

Operation. i. Swabbing the vagina with Violet-green.—The patient being placed in the lithotomy position, the vagina is swabbed out with Violet-green so as to sterilize the passage and to render it easily visible from above, when the surgeon opens it.

ii. Opening the abdomen.—See p. 274.

iii. Reflecting the bladder.—The lower peritoneum in front of the uterus is now divided transversely across the front of the uterus and broad ligaments. The bladder is then reflected from the supravaginal cervix until the vagina is reached.

iv. Incising the cervix.—The cavity of the body of the uterus is now opened by a median incision through the lower part of the body,

and by means of Mayo's scissors the incision is carried downwards until the whole cervix is divided. The anterior vault of the vagina is opened during this procedure (Fig. 350).

v. Suture of the incision.—The edges of the cut surfaces of the lower part of the body of the uterus and cervix are now brought together with interrupted catgut sutures so that they do not include the whole thickness of the cut edges (Fig. 351). The canal is thus left permanently

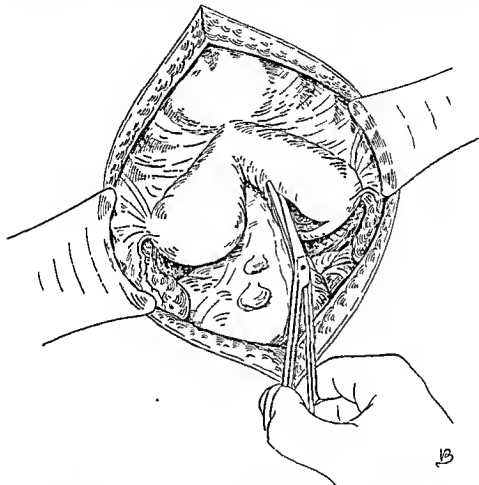


Fig. 352.—Joining a double uterus: Making the lateral incision.

enlarged. The lowest two of these sutures lie in the vagina. The small hole in the vaginal vault is closed separately.

After-treatment.—See p. 24 and Chapter XXIX.

Remarks.—Though all the patients on whom we have performed this operation have made excellent recoveries, and some have been markedly relieved, it is obviously a procedure only to be carried out when every other treatment, except this and pre-sacral sympathectomy, has failed.

UNITING THE TWO HALVES OF A DOUBLE UTERUS

In that form of double uterus known as uterus bicorporis unicollis the two bodies can be joined together. The operation is sometimes indicated when the deformity is accompanied by severe dysmenorrhœa or by a history of repeated miscarriages.

Operation.—The circulation through the uterus may be controlled by the myomectomy clamp and two ring forceps as described under myomectomy (*see p. 424*). The corpus on one side is incised along its

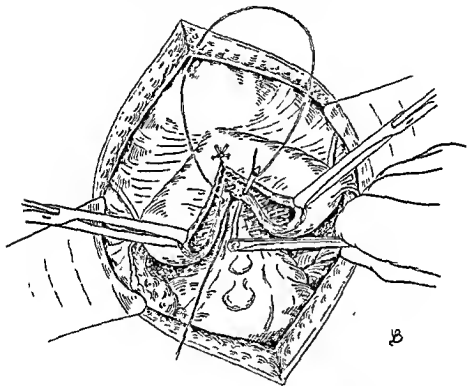


Fig. 353.—Suturing together the two halves.

inner border from the fundus down to the single cervix, the incision opening the cavity throughout its whole length (Fig. 352). The same procedure is then carried out on the opposite side.

The two halves are then joined together by interrupted catgut sutures inserted in exactly the same manner as in utriculoplasty (Fig. 353), the surfaces having been trimmed flat.

The operation could be performed on a completely double uterus, but it would be more difficult and would necessitate the removal of the vaginal septum as well.*

* See Victor Bonney and A. Macindoe, *Jour. Obst. Gyn. Brit. Emp.* 1944, No. 1, II, 24

PRE-SACRAL SYMPATHECTOMY

Certain forms of intractable pain of pelvic origin in women have of recent years been treated by excising a portion of the pre-sacral sympathetic nerve-trunk. The trunk, which consists of one or two flat bands of neuro-ganglionic tissue is exposed on the face of the last lumbar vertebra (Fig. 354).* The conditions for which the operation

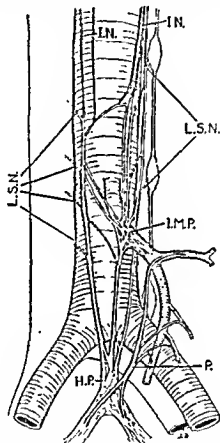


Fig. 354.—Diagram showing the sympathetic and parasympathetic supply to the distal colon :

- I.N., intermesenteric nerves;
- L.S.N., lumbar splanchnic nerves;
- I.M.P., inferior mesenteric plexus;
- P., parasympathetic fibres for distal colon;
- H.P., hypogastric plexus.

(Reproduced by courtesy of E. D. Telford and J. Stopford.)

has been carried out are principally dysmenorrhœa, pelvic pain without physical signs, and for the relief of pain in advanced carcinoma of the cervix. Good results have been claimed by certain writers, but in this country, at all events, the operation is less in favour than it was.

* See an excellent paper by E. D. Telford and John Stopford, *Brit. Med. Journ.* March 31, 1934. The authors point out the tendency to divide the parasympathetic fibres going to the distal colon in the sheet of tissue that contains the sympathetic nerves. We are indebted to the authors for the diagram that accompanies their paper.

It is to be remembered that the causation of chronic pelvic pain in women is very little understood, and that clinically various forms of treatment, some of them quite illogical, may succeed on occasions in curing it—at least for the time being—and the same considerations apply to dysmenorrhœa. Moreover the operation is one of some severity, so that in our opinion it should not be undertaken until all lesser means of alleviating the patient's sufferings have been tried and have failed.

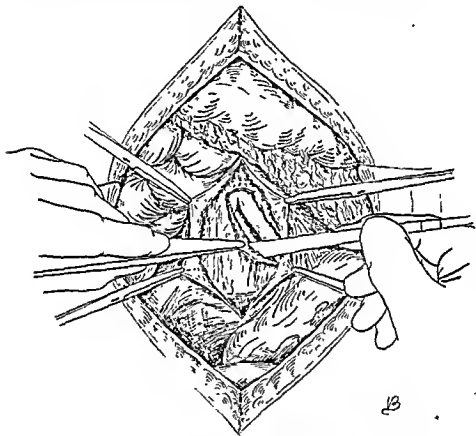


Fig. 355.—Excising the sheet of tissue that contains the sympathetic nerve trunks.

Preparation.—See p. 78.

Instruments.—See p. 274.

Operation. i. **Opening the abdominal cavity.**—An incision should be made extending from 2 inches above the umbilicus to 3 inches below it.

ii. **Packing off the intestines.**—The position of the promontory of the sacrum, the bifurcation of the aorta, the common iliac arteries and the last two lumbar vertebræ having been identified, the intestines are packed away with swabs. In particular the pelvic mesocolon has to be displaced well to the left side.

iii. Dividing the peritoneum.—The peritoneum covering the body of the last lumbar vertebra is now picked up with forceps and incised, and the incision is then extended upwards as high as the bifurcation of the aorta, and downwards to the promontory of the sacrum. The peritoneal edges are then seized with forceps and the peritoneum is separated laterally on either side.

iv. Excising the nerve trunk.—The nerves run in the sheet of tissue covering the common iliac vessels and the front of the body of the 5th lumbar vertebra. The operator begins by separating it from the left common iliac artery for about 2 inches along a line corresponding to the artery. The separation is continued from left to right, first the artery and then the left common iliac vein being stripped bare. Still working from left to right, the body of the vertebra next comes into view, and finally the right common iliac artery. The sheet of tissue having been raised from all these structures for about 2 inches the raised portion is now cut away together with the portion of the nerve trunk included within it. Any small vessel that bleeds should be ligatured (Fig. 355).

v. Suture of peritoneum.—The opening in the peritoneum is then closed by a continuous catgut suture.

vi. Closing the abdominal cavity.—See p. 286.

Difficulties and dangers.—In fat subjects the operation area lies deep. The inferior mesenteric artery may be mistaken for a nerve trunk if it runs, as it often does, almost vertically downwards. As a rule there is but little bleeding, but there is always the possibility of encountering an adventitious vessel of some size, injury to which, or to the common iliac vein to which it will probably be tributary, would give rise to very embarrassing hæmorrhage. The left ureter sometimes runs abnormally close to the middle line and is liable to be mistaken for one of the nerve trunks and cut.

Dressing and after-treatment.—See p. 24 and Chapter xxx.

CHAPTER XXI

OPERATIONS TO REMEDY DISPLACEMENTS OF THE GENITAL CANAL

THE particular operation best suited for any given case of displacement of the genital canal must be determined by a careful consideration of the exact nature of the displacement. We shall, therefore, first proceed to certain anatomical considerations.

The supporting mechanism of the genital canal.—The sustentacular apparatus of the female genital canal is made up of a number of structures anatomically and functionally separate, the giving way of any or all of which is followed by a displacement varying in form according to which of the structures is at fault.

The apparatus is divisible into three segments, upper, middle, and lower.

The upper segment consists of the peritoneal folds of the broad ligaments and the structures contained within them and, in conjunction with the intra-abdominal pressure which is normally applied through the intestines to the back of the uterus, keeps that organ in anteversion.

The middle segment is principally composed of the cardinal ligaments, two strong fan-shaped expansions of fibro-muscular tissue which, arising on either side from the lateral aspect of the supravaginal cervix and the lateral aspect of the vagina down to the point where the canal passes through the pelvic diaphragm, are attached to the side walls of the pelvis and the fascia covering the upper surface of the levatores ani.*

These ligaments form the chief mechanism which holds the vagina in its normal position, but their action is supplemented by: (a) a sheet of unstriped muscle fibres, which pass from the back of the subpubic ligament to the anterior vaginal vault and supravaginal cervix. The sheet is called the pubo-cervical musculo-fascia and it lies between the base of the bladder and the anterior vaginal wall; (b) a thin fascia of similar structure that invests the posterior vaginal wall; and (c) the intra-abdominal pressure, which is normally applied through the intestines in Douglas's pouch to the back of the vagina in its upper part. This pressure helps to keep the upper end of the vagina forward so that together with the anteverted uterus the genital canal forms a curve with the concavity facing forwards.

The lower segment consists of the pelvic floor proper, and comprises the levator ani and superficial perineal muscles, together with the

* These ligaments were first accurately described by A. Nyaulasy of Australia.

fasciæ above, below, and between them. Included in this segment is the wedge-shaped perineal body intervening between the lower ends of the vagina and rectum and causing them to diverge from one another, thus increasing the forward curve of the genital canal, and producing a valve-like mechanism whereby anything coming down the vagina is prevented from passing straight out. The lower third of the vagina is firmly attached to this segment and is supported by it.

Displacement either of the uterus or vagina is primarily due to some defect in this complex supporting apparatus, but the character of the displacement, and, therefore, its appropriate treatment, depends on which particular part of the apparatus has given way.

Retroversion of the uterus.—Laxity limited to the broad ligaments merely mobilizes the body of the uterus so that it bends backwards (retroflexes) on the firmly held cervix. Such cases are not, however, common, because, as a rule, relaxation of the broad ligaments is accompanied by laxity of the upper parts or the whole of the cardinal ligaments. In this event the cervix is also loosened, so that as the body of the uterus goes backwards it comes forwards and typical retroversion is accomplished. When the body of the uterus has moved back sufficiently, more of the intestines lie in front of the uterus than behind it, and the intra-abdominal pressure, which is the sum of the weight of the movable viscera, the intestinal gas pressure, and the pressure of the abdominal muscles and diaphragm, acts chiefly on the front of the uterus, increasing its backward displacement.

Retroversion of the vagina.—Laxity of the cardinal ligaments allows the vagina to sink backwards towards the sacrum. This displacement, which is a very common one, is easily recognized if attention be paid to the line of the axis of the vagina. The cervix goes back with the vagina, but if the broad ligaments are unyielding, the body of the uterus remains forwards so that the displacement termed "retroposition of the uterus" is produced. More commonly, however, the uterus is retroverted as well as the vagina.

The backward movement of the vagina opens up the utero-vesical pouch, so that an undue proportion of the intestines comes to lie in it with the result that undue pressure is brought to bear on the anterior vaginal wall and a *cystocele* will sooner or later result.*

Prolapse.—Prolapse is best defined as that state in which the vagina is partially or completely turned inside out under the stress of the intra-abdominal pressure. The bulging-in movement by which this is accomplished starts at some point or points in the vaginal wall, and thence spreads until, in extreme instances, the whole canal is extroverted. There are three main situations in which the turning inside-out movement may be initiated, the vaginal vault, the anterior

* Victor Bonney, "An Address on Genital Displacements," *Brit. Med. Journ.*, March 17, 1928.

wall and the posterior wall, and the clinical varieties of prolapse are best classified on this basis.

Vault prolapse.—The whole vault is usually affected, so that the vaginal cervix, which in this connexion may be regarded as the centre of the vault, descends with it. Occasionally, however, the bulge inwards is limited to the posterior part of the vault or to the anterior part or both parts together, the cervix remaining at its normal level. Posterior vault prolapse is a true hernia of Douglas's pouch, the protrusion containing a sac of peritoneum, while the rectum takes no part in it though it is often mistaken for a rectocele. Anterior vault prolapse is frequently mistaken for a cystocele, but the protrusion is above the limits of the bladder.

Prolapse of the anterior wall.—The commonest form of this variety of prolapse is cystocele, in which the vaginal wall and pubo-cervical musculo-fascia "hammock" downwards accompanied by the base of the bladder.* A less common form is that in which the protrusion affects only that part of the vaginal wall which is in relation to the urethra, with the result that the sphincteric mechanism of the bladder is disturbed, giving rise to stress incontinence (*see p. 566*).

Prolapse of the posterior wall.—Rectocele is due to laxity of the pubo-coccygeal segment of the levator diaphragm, combined with default of the perineal body, whereby the unsupported posterior wall bulges forwards. In a true rectocele there is, in addition, a yielding of the lateral ligaments of the rectum, so that the bowel slips downwards on the face of the sacrum and buckles forwards.

Operative considerations.—The operations for the cure of female genital displacements may be broadly divided into two groups: (1) repair operations, and (2) substitution operations. Clearly it would be best to repair the part or parts of the supporting apparatus which were at fault, but this is not always feasible, because certain of the structures, e.g. the cardinal ligaments, are not easily accessible, and, further, the laxity that brings about the displacement is due to a deterioration in the tissues which an operation cannot alter, so that the surgeon in his reparative endeavour has only faulty material to make use of.

As examples of operative repair the various methods of shortening the round ligaments for retroversion may be cited, while ventralfixation is a perfect example of operative substitution, the surgeon discarding the natural supporting structures for one artificially fashioned.

In nearly all cases of prolapse, the vaginal wall over the area of the protrusion is redundant, and a certain amount will need to be cut away in order to restore the normal calibre of the canal. Since

* Victor Bonney, "Diurnal Incontinence in Women," *Journ. Obst. and Gyn. of Brit. Emp.*, Vol. XXX, No 5, 1923. The term "stress" was first applied by Eardley Holland.

the ease with which a tube can be turned inside out depends in the last resort on the relation between its calibre and the thickness of its wall, it is obvious that any case of prolapse can be cured by the simple expedient of cutting away so much of the vaginal wall that, relative to its calibre, it is too thick to turn inside out. Such extensive colporrhaphy (including Le Fort's operation, which has the same *rationale*) is, however, only applicable to old patients. Laxity of the levatores and laxity of the pubo-cervical fascia lend themselves peculiarly well to reparative procedures, as does deficiency of the perineal body. Laxity of the cardinal ligaments, on the other hand, is difficult to repair, short of an operation unjustifiably severe, except when the weakness is limited to their upper part only. Vaginal retroversion, therefore, is better dealt with by the substitution operation of ventralfixation.

Vault prolapse can be treated reparatively by reducing the area of the vault by excising part of it, including the cervix, which in this connexion is to be regarded as part of the vault area. The operation (Fothergill's) also effects a certain degree of tautening of the upper fibres of the cardinal ligaments. On the other hand, a substitution operation may be performed, the uterus being turned by ventralfixation into an artificial ligament. Which of the two should be chosen depends on the case; coincident hypertrophy of the cervix indicates the former, retroversion of the vagina and uterus the latter.

In a large proportion of cases, some combination of the various operations presently to be described will be required. For example, colpo-perineorrhaphy may be combined with anterior colporrhaphy or with Fothergill's operation for vault prolapse, or with ventralfixation or shortening of the round ligaments. Such multiple procedures are commonly referred to as "round-trip operations."

It is apparent, then, that a universal rule cannot be laid down for the operative cure of genital displacements. Every case must be dealt with according to its individual peculiarities, and the surgeon who lauds one particular procedure as a panacea has not stopped to think.

Finally, we would point out that the worst possible course pursuable in a case of prolapse is to remove the uterus. Prolapse is a purely vaginal phenomenon. The uterus not only takes no part in it, but actually, by its bulk, opposes the descent of the vaginal wall. It is for this reason that complete procidentia is almost limited to women in whom the uterus has undergone post-menopausal atrophy or has been removed.*

The foregoing is not meant to imply that the plastic operations which

* The point is further illustrated by the difficulty of curing a case of prolapse in which the entire uterus has previously been removed, without narrowing the vagina to a degree which prevents sex relations.

include removal of the uterus on account of the prolapse do not succeed in curing the prolapse, but the point is that equally good results can be obtained without so unnecessarily increasing the magnitude of the operation. The objection does not apply to those cases where the uterus is removed because it is unhealthy.

The preparation of the patient (*see p. 76*) and the list of instruments will be the same for all the vaginal operations.

Instruments.—Catheter, Auvard's speculum, 4 pairs of pressure forceps, Bonney's dissecting forceps, bladder-sound, volsella, blunt-pointed scissors, Reverdin's needle, curved needles Nos. 7 and 1, 20-day catgut sutures No. 1 and four short Kocher forceps.

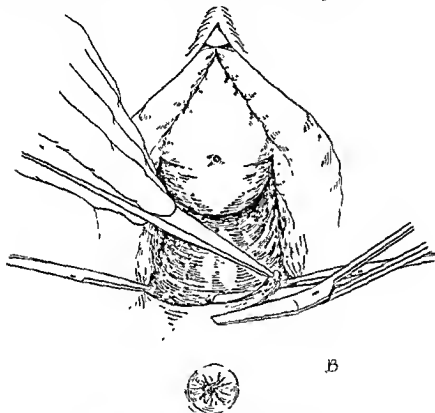


Fig. 356.—Colpo-perineorrhaphy: Cutting away the muco-cutaneous junction.

COLPO-PERINEORRHAPHY

Indications.—This operation is performed for an old ruptured perineum, a relaxed vaginal outlet, rectocele, or as part of the "round trip" operation for prolapse.

Operation.—The operation is carried out in nine steps:

1. Demarcation of flap.—On each side the point marking the posterior extremity of the *carunculæ myrtiformes* is seized with a pair

of Kocher forceps, and, these being retracted by assistants, the edge of the perineum is put upon the stretch. This edge is now cut away between the two pairs of pressure forceps with scissors (Fig. 356), and

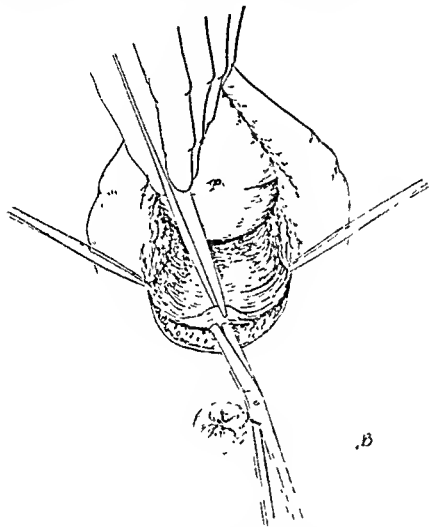


Fig. 357.—Beginning the separation of the posterior vaginal wall.

the raw edge of the posterior vaginal wall seized in the middle line with dissecting forceps.*

ii. Reflecting the posterior vaginal wall.—The operator, holding the dissecting forceps with his left hand, puts the posterior vaginal wall on the stretch, and by means of scissors separates it till the plane of cellular tissue between the rectum and vagina is entered (Fig. 357). With his right index finger he then identifies the plane between the rectum and the posterior vaginal wall. If the correct plane is struck,

* A common mistake is to place the marking forceps on the labia minora instead of on the mastiform caruncles, with the result that at the close of the operation the skin forms an operculum partially obstrucing the vaginal orifice.

little difficulty will be experienced in reflecting, with the index finger, the flap of vaginal wall as high as may be deemed sufficient and, as a rule, only a slight amount of venous oozing will result (Fig. 358).

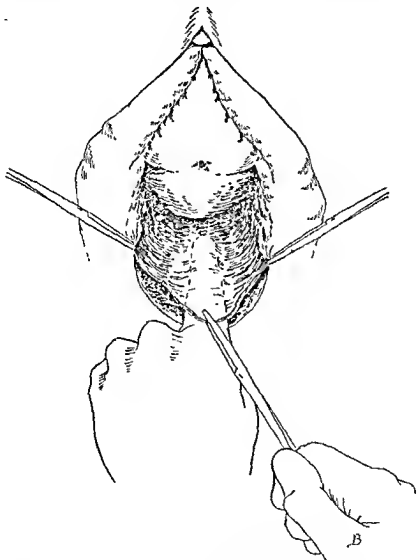


Fig. 358.—Separating the posterior vaginal wall from the rectum by means of the index finger.

iii. Separating the lateral tissues.—With the index finger still between the rectum and vaginal wall, and guarding the former, the tissues lateral to the line of separation already effected are put upon the stretch, by pulling in opposite directions the pressure forceps which has been attached to the middle of the flap and that attached to the carunculæ myrtiformes on one side, and are then divided by the scissors,

thus freeing the flap on that side. The same procedure is then carried out on the opposite side (Fig. 350). The vaginal wall is then exerted by means of the fingers of the left hand as shown in Fig. 360, and the separation is completed by means of a gauze swab.



cases, however, it is necessary to remove a long length of the wall reaching, perhaps even as far as the cervix. There are certain cases indeed, namely in that rare form of prolapse in which the bulge principally affects the posterior vaginal vault (hernia of Douglas's pouch), in which the excision is chiefly required from the upper 2 inches on the posterior wall (Fig. 361).

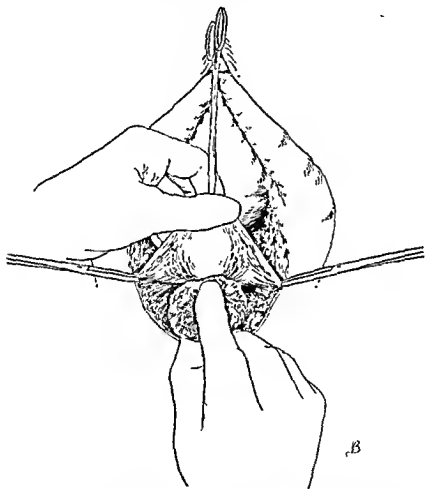


Fig. 360.—Further separation of the vaginal wall by swab-pressure.

When it is desired to remove a long strip of the posterior wall in addition to the V-shaped excision at the entrance, this is best effected by pulling the centre of the vaginal flap steadily downwards while making two parallel cuts running up the length of the vagina as high as may be required, a marking forceps being placed on the point at which the excision is to terminate (Figs. 362, 363). It will be found that by this manoeuvre the entire posterior vaginal wall up to the cervix can be easily excised.

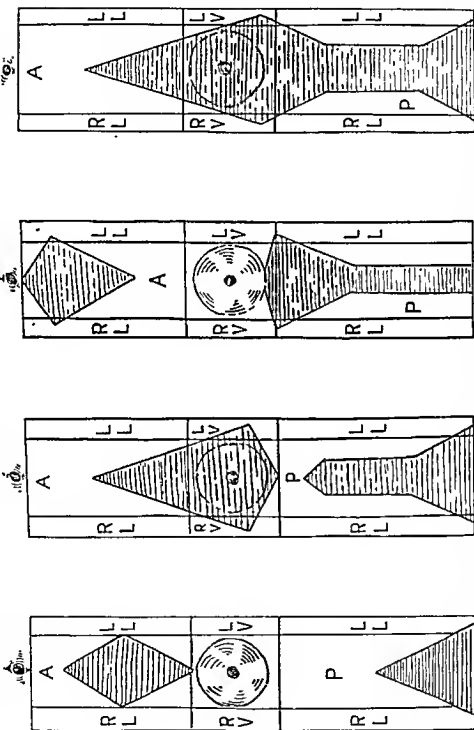


Fig. 361.—Diagram to show the areas of vaginal wall to be excised in: 1, anterior colporrhaphy (above), and perineorrhaphy (below); 2, Fothergill's operation (above), colpo-perineorrhaphy (below); 3, the operation for stress incontinence (above), the operation for hernia of Douglas's pouch (below); 4, the operation for complete procidentia. A, anterior vaginal wall; P, posterior vaginal wall; RL, right lateral wall; LL, left lateral wall; RV, right lateral vault; LV, left lateral vault.

The oozing which occurs will usually be controlled when the approximating sutures are inserted. Bleeding in excess of this must be secured with catgut ligatures on the bleeding-points.

v. Restoring the posterior vaginal wall.—The posterior vaginal wall is restored in two stages by suturing its cut edges with a No. 1

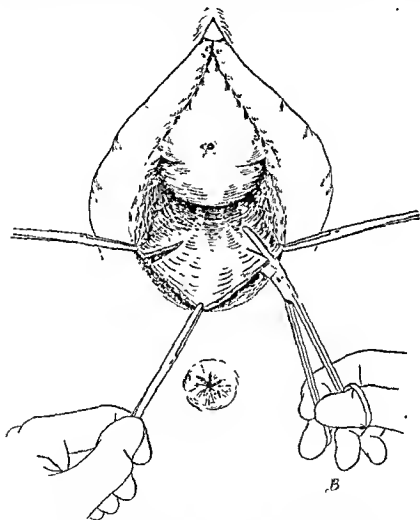


Fig. 362.—Excision of part of the posterior vaginal wall.

continuous catgut suture. The suturing is commenced at the apex of the incision and is carried along until the upper half of the gap is closed, when the suture is tied or discontinued until the levatores ani have been approximated, for if the whole gap be closed it is difficult to get at these muscles to suture them (Fig. 364).

vi. Approximation of the levatores ani muscles.—The edges of the levatores ani appear in the depth of the wound as a couple of ridges,

one on each side. When they have been identified, the index finger of the left hand is passed between them and the rectum pressed back so as to tense the muscles and make them more plainly visible. They are now approximated in front of the rectum by three or four interrupted catgut sutures firmly tied (Fig. 365).

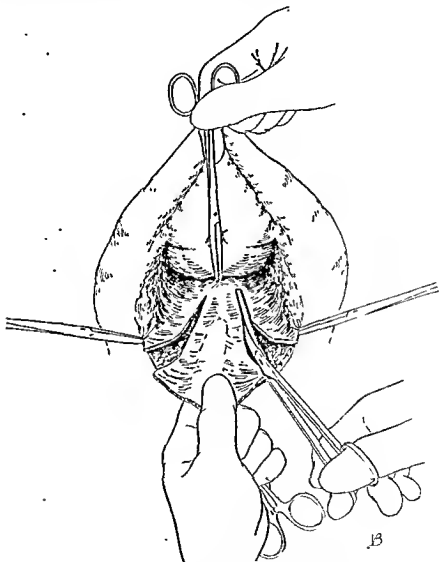


Fig. 363.—Continuing the excision upwards.

vii. **Completing the suturing of the vaginal edges.**—The suturing of the cut vaginal edges, as mentioned above, is then completed (Fig. 366) down to the new vaginal orifice and there tied off.

viii. **Suture of the fascial layers.**—The cut edges of Colles's fascia and the fascia superficial to it are now brought together with interrupted No. 1 catgut sutures (Fig. 367).

ix. Suture of the skin.—The perineum will now be restored, with the exception of the skin-edges. These are united with interrupted No. 1 catgut sutures (Fig. 368).

Dangers. i. Sepsis.—Owing to the situation of the wound, and the impossibility of procuring absolute asepsis, suppuration after

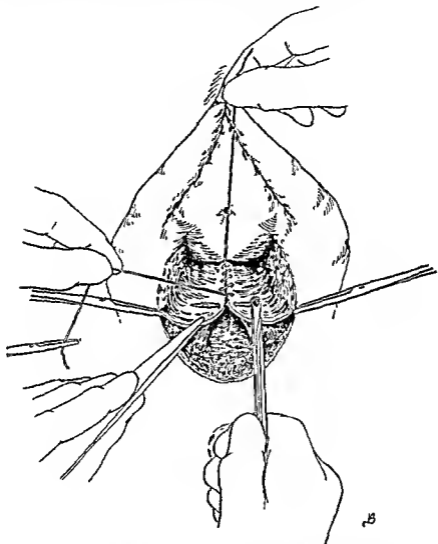


Fig. 364.—Suture of the upper part of the vaginal wall.

posterior colpo-perineorrhaphy is a possibility in the most favourable circumstances. It does not usually give rise to much constitutional disturbance, but occasionally severe symptoms of sepsis may appear. Suppuration, if extensive, is a disaster, since it may increase the deficiency of the tissues. In this event, further operation should not be undertaken for at least 6 months. If the wound shows signs of

suppuration, all stitches must be immediately removed and fomentations applied. Care must be taken to avoid puncturing the rectum when dissecting up the posterior vaginal flap, since such an accident will increase the risk of infection of the operation area, and may lead to the formation of a recto-vaginal fistula.

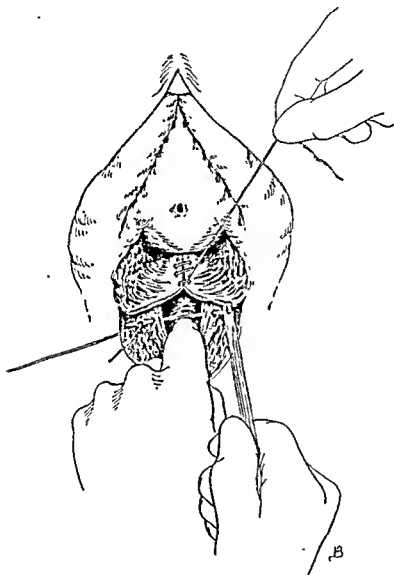


Fig. 365.—Suture of the levatores ani.

ii. *Hæmorrhage*.—As a rule the rather free oozing stops as soon as the sutures have been passed and tied, but if there are any spurting vessels, or if the venous oozing is very marked, the bleeding-points must be secured with mattress-sutures or ligatures, for if this be not done, and the bleeding continues, either a hæmatoma will form under the flap with the result that the wound will break down in a day or

two, and perhaps suppurate, or the patient will have again to be anæsthetized, the wound opened up, and the bleeding-spots secured.

It is as well to remember that an alarming amount of bleeding may take place between the vagina and rectum without much external evidence, and we recall a case in which a patient in these circumstances nearly bled to death, a fatal issue being averted only by saline venous

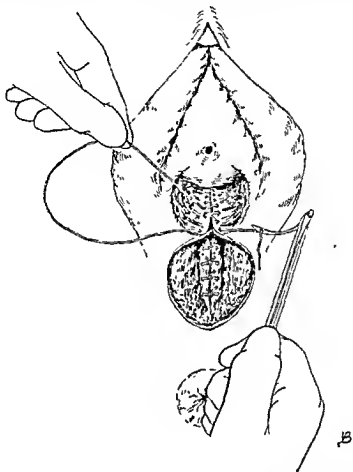
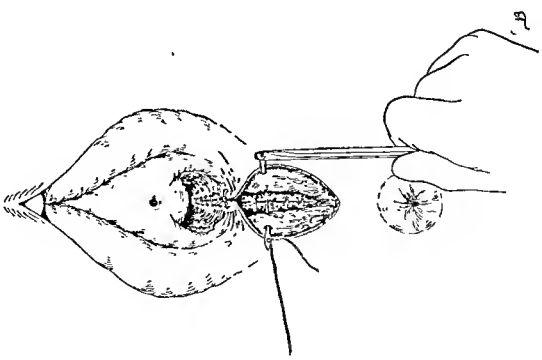
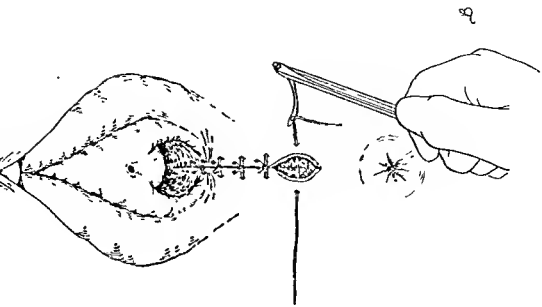


Fig. 366.—Suture of the lower part of the vaginal wall.

infusion after the hæmorrhage had been arrested. Secondary hæmorrhage may occur as late as the 16th day after operation. In such an event, the patient must be anæsthetized and the condition of the parts explored. If a bleeding-point, or points, can be seen, they should be secured by mattress-sutures. In certain cases, however, it will suffice to plug the vagina for 48 hours with gauze soaked in flavine 1-in-500.

iii. Too extensive removal of the vaginal wall.—This is a very real danger and is usually due to inexperience. The amount of vaginal wall to be cut away is a matter of judgment. When the wall is very



redundant a free excision will be required but there is a class of case in which, in spite of the prolapse, there is little or no redundancy of tissue. In such patients it will be noted that the vaginal wall is thin and smooth. Free excision in such will lead the operator into serious

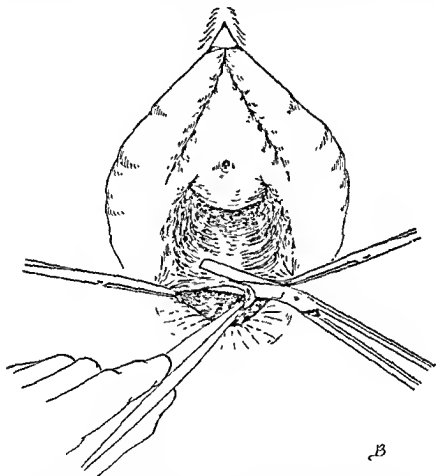


Fig. 369.—Complete perineorrhaphy: Excising the edge of the recto-vaginal septum.

difficulty, for he will find, to his dismay, that the edges of the cut vagina cannot be approximated without severe tension, and that when this tension is applied the stitches cut through. It is, therefore, a wise plan in all cases of doubt not to cut away the full amount of vaginal wall at once, but to remove it in successive portions, regulating the amount according to the ease with which the edges can be approximated. Too free removal of the vaginal wall in a woman still having sexual relations with her husband, will result in more or less dyspareunia or even total incapacity for the act, and moreover, this very unfortunate result may be extremely difficult to rectify.

Dressing and after-treatment.—*See p. 24 and Chap. xxix.* If, after the operation is finished, marked oozing between the stitches occurs, this can be arrested by plugging the vagina with flavine gauze. The patient should not get up before the 16th day. The catgut stitches in the vagina separate and come away themselves.

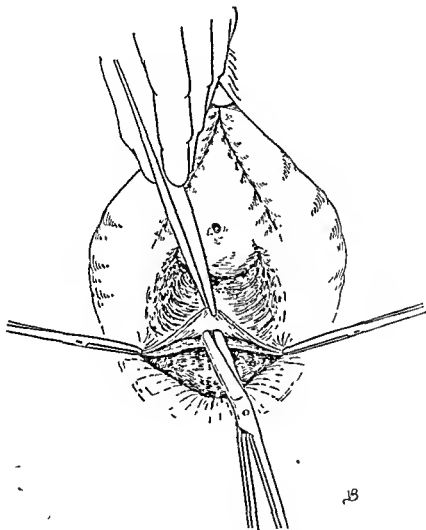


Fig. 370.—Raising the posterior vaginal flap.

PERINEORRHAPHY FOR COMPLETE RUPTURE

The operation for complete rupture of the perineum is similar to that of colpo-perineorrhaphy, but includes the repair of the torn rectum and rectal sphincter, so that the outlet of the vaginal and rectal canals, which were previously separated only by the thin recto-vaginal septum,

are restored to their normal conformation by the construction of a new perineal body, and control is re-established over *feces* and *flatus*.

i. *Demarcation of the vaginal flap.*—Two pairs of forceps, one on each side, are affixed to either extremity of the sharp edge of the exposed recto-vaginal septum and so at the ends of the lacerated sphincter, and the edge, being pulled taut, is then cut away with scissors, thus clearly exposing the posterior vaginal wall from the anterior rectal wall (Fig. 369).

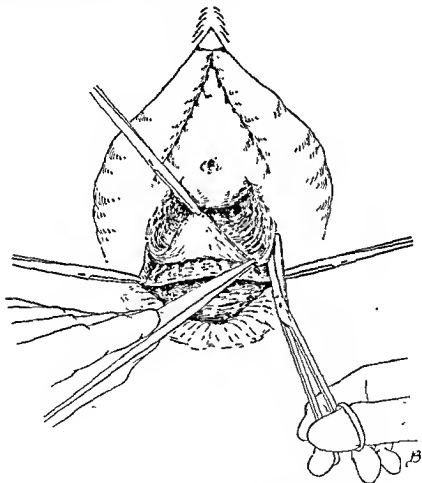


Fig. 371.—Separating the flap laterally.

ii. *Separating the vaginal wall from the rectum.*—The cut edge of the vaginal wall is now pulled up with dissecting forceps and the vaginal wall is separated from the rectum by the scissors in the manner already explained when describing *colpo-perineorrhaphy* (Fig. 370). The flap is then freed at the sides with scissors up to as far as the most posterior of the *myrtiform caruncles* (Fig. 371).

iii. Restoration of the anterior rectal wall.—The reflected flap having been lifted out of the way, the lateral forceps fixed to the ends of the lacerated sphincter are next approximated, so that its raw edges and those of the rectal deficiency above it are brought into apposition, and these are then united with a No. 1 20-day continuous catgut suture, inserted Lembert-wise so as to avoid penetrating the rectal mucosa.

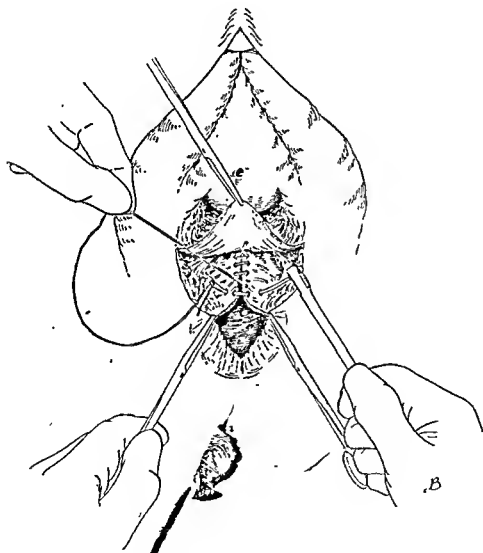


Fig. 372.—Suturing the rectum.

This suture is carried down to the points where the marking forceps have been applied and is there tied off, thus restoring the circular lumen of the bowel up to that point. The marking forceps should now be taken off (Fig. 372).

iv. Fashioning the vaginal flap.—A V-shaped portion is now excised

from the vaginal flap, but since, as a rule, prolapse is not present, the portion cut away need not be large, and in some cases cutting away is not required (Fig. 373).

v Restoration of the posterior vaginal wall and approximation of the levatores ani.—The method of performing these steps of the operation differs in no respect from those already described under colpo-perineorrhaphy. The V-shaped gap in the posterior vaginal wall should be closed in two sections. The series of sutures approximating the levatores should be carried backwards as far as possible, so as to restore the internal sphincter (Fig. 374).

vi. Freeing the sides of the anal canal.—The sides of the anal canal are

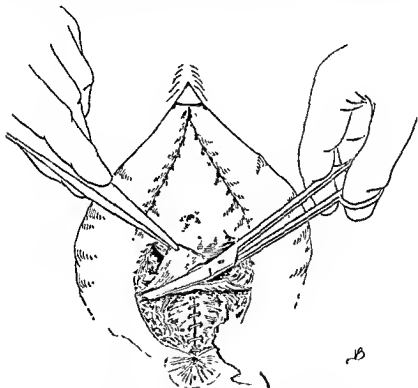
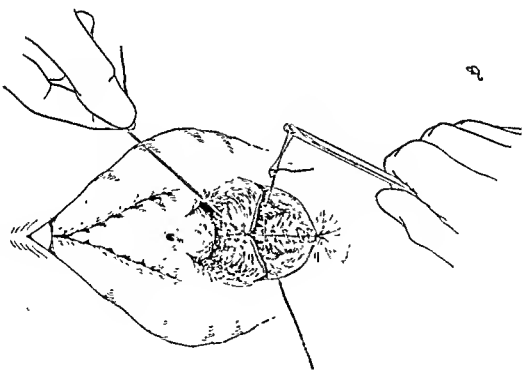
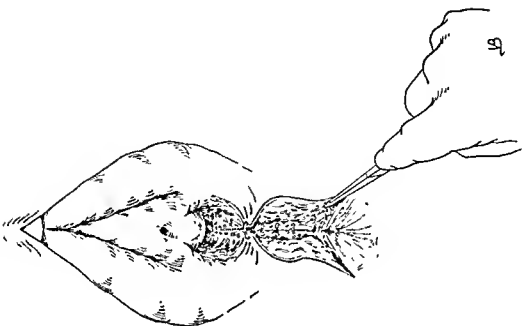


Fig. 373.—Excising a portion of a vaginal flap.

now freed by making an incision with the scalpel on either side, backwards and outwards from the outer extremity of the original transverse incision for half an inch at the side of the anus, parallel with the uppermost anal rugæ on either side (Fig. 375).

vii. Approximation of the superficial fascia and the external sphincter.—This is carried out in the manner described on p. 521. It is the most posterior of these sutures that picks up the external sphincter, and to ensure that it does so, the termination of the bowel should be well



pushed back with the index finger while the suture is being passed (Fig. 376).

viii. Skin sutures.—The cut edges of the skin are united by interrupted sutures (Fig. 377). The last two or three of these sutures

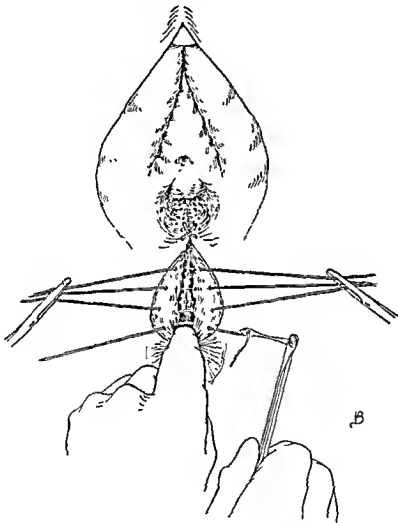


Fig. 376.—Suture of the superficial fascia.

complete the formation of the anus, the rugæ of which should appear like the spokes of a wheel. If this result is not attained the operation has been imperfectly performed.

Dangers. i. Sepsis.—See p. 522. If the operation has been

carried out in the way described, the wide separation of the vaginal and rectal canal will permit a certain amount of suppuration with yet a fair functional result in the end.

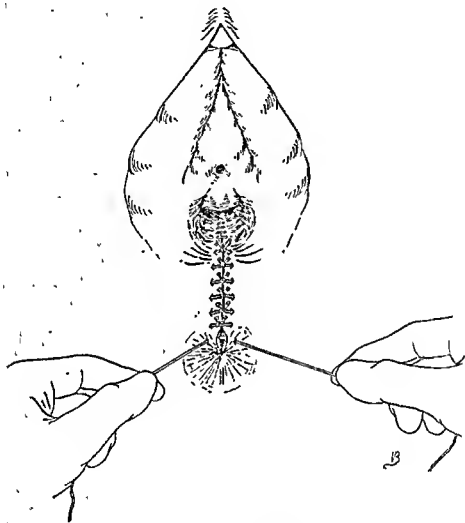


Fig. 377.—Suture of the skin.

ii. Hemorrhage.—See p. 523.

iii. Too extensive removal of the vaginal wall.—See p. 524.

Dressing and after-treatment.—As for colpo-perineorrhaphy; see p. 24 and Chapter xxx with the addition that special care must be taken over the bowels. As soon as the sickness caused by the anæsthetic has ceased, the patient should take 1 oz. of liquid paraffin twice a day, and this should be continued for at least 4 days, after which she should

be given an aperient by mouth. The paraffin should be taken regularly for another week or two to keep the motions soft. An enema should never be given.

ANTERIOR COLPORRHAPHY

Indications.—The operation is performed for the cure of a cystocele or prolapse of the anterior vaginal wall. There are various ways of doing this operation, but we shall only describe the one which, in our experience, is the best—the buttress operation of the late Blair Bell.

Operation.—The speculum having been inserted, the cervix is pulled down with the volsellum, and the anterior vaginal wall is put on the stretch.

i. **Partial separation and division of the anterior vaginal wall.**—The loose tissue of the anterior vaginal wall, just above its firm attachment to the supravaginal cervix, is seized with a pair of dissecting forceps, and with the scissors a transverse cut is made in the middle line into the cellular tissue sufficient to admit the finger-tip (Fig. 378). The limits of the bladder can be ascertained, if the operator so desires, by the bladder-sound. The lower cut edge of this incision having been secured by a pair of pressure forceps, the index finger of the right hand is then inserted into the cellular tissue and pushed downwards to just above the level of the urethra, thus separating the anterior wall of the vagina from the bladder in the plane of cleavage (Fig. 379). The separated portion of vaginal wall is then divided in the middle line with the scissors, from the original incision up to the lower limit of the detachment (Fig. 380).

ii. **Completion of the separation of the vaginal wall.**—Two pairs of pressure forceps are now affixed on each side to the cut edges of the vaginal wall; two at the upper ends of the flaps, and two at the lower ends. By means of these forceps the edges of the flaps are retracted and the vaginal wall is further separated laterally by means of swab-pressure and small scissor-cuts on each side as far as the operator deems sufficient, thus freeing the sides of the bladder (Fig. 381).

iii. **Separation of the bladder.**—The bladder is then separated from the cervix at its lowest limit by small cuts with the scissors, and when this attachment is freed the bladder is separated from the supravaginal cervix with swab-pressure till it can be pushed up out of the way (Fig. 382). Attention need not be paid to any slight oozing that results during this part of the operation, but if any veins or arterioles are divided, they should be securely ligatured with No. 1 catgut.

It occasionally happens that some large veins in the lateral receding angles at the junction of the reflected vaginal wall and bladder are

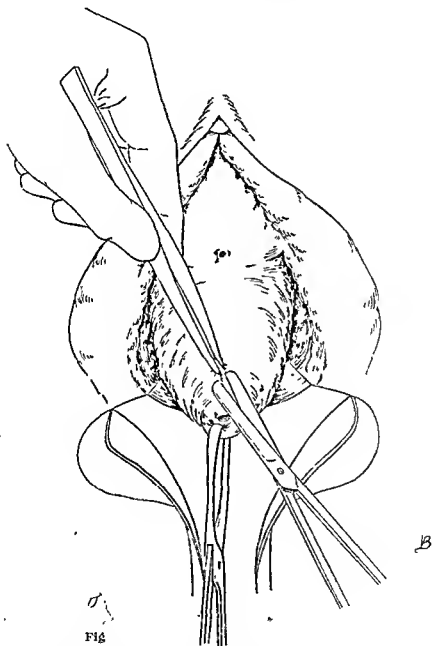


Fig. 378.—Anterior colporrhaphy: Incising the anterior vaginal wall.

injured, resulting in a fair amount of bleeding. Such points are best secured with mattress-sutures of catgut.

iv. Suturing the subvesical fascia.—The two flaps of vaginal wall

are now brought together along the outer limits of their demarcation, by means of a continuous No. 1 catgut suture which, picking up the raw surface of the flap without emerging on the vaginal surface, is yet passed deep enough to include the fascia lying between it and the



Fig. 379.—Separating the vaginal wall from the bladder by means of the finger.

bladder. This suture is continued until the bare supravaginal cervix is reached and then the last stitch is made to pass through the substance of the supravaginal cervix and is tied there. By this device the bladder is entirely cut out from the subsequent field of operation (Fig. 383).

v. Formation of the buttress.—A series of mattress-sutures is inserted

as follows. The right flap having been pulled over to the left, the needle is made to transfix the anterior vaginal wall, including a little of the subvesical fascia, just external to its limit of separation, and the needle, being brought out through the raw surface of the right flap, just

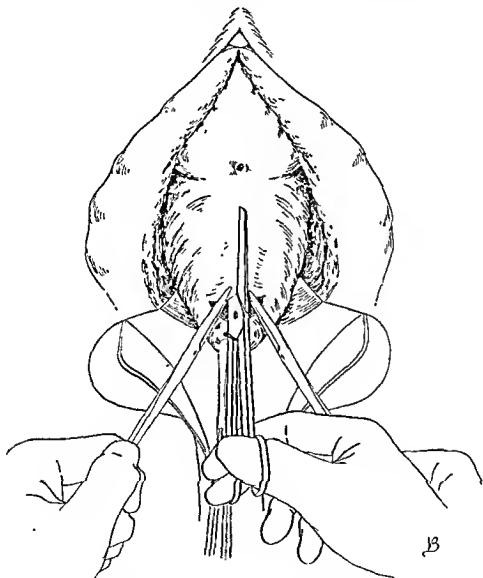


Fig. 380.—Splitting the anterior vaginal wall.

external to the start of the continuous suture, is carried across to a similar point on the raw surface of the left flap which it transfixes. The left flap being pulled over to the right side, the needle emerges through the anterior wall on the left side just external to the limit of separation. It is then withdrawn, bringing with it one end of a catgut suture. The

needle is then inserted, half an inch higher up, through the anterior wall on the right side, and the right flap being pulled over to the right, the needle emerges through the raw surface of the right flap, just external to the continuous suture. The needle, being carried across to a similar point on the left side, is made to transfix the flap; and, this being pulled

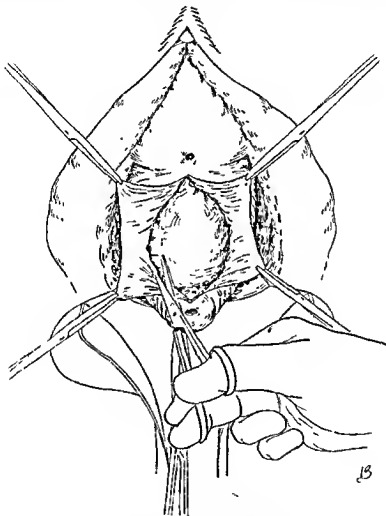


Fig. 381.—Separating the vaginal flaps laterally.

over to the right side, the needle emerges through the anterior wall of the vagina on the left side. The needle is now withdrawn, bringing with it the other end of the suture. The mattress-suture thus inserted is not immediately tied but has a pressure forceps placed on its free ends.

Three or four of these sutures are inserted from before backwards with the result that when they are tied the vaginal flaps are brought

together in the mid-line and a prominent ridge is formed which makes the anterior vaginal wall taut and forms a buttress of support (Fig. 384). The vaginal canal is thus narrowed, and the bladder is still further prevented from sagging down by the ridge of tissue constructed underneath it.

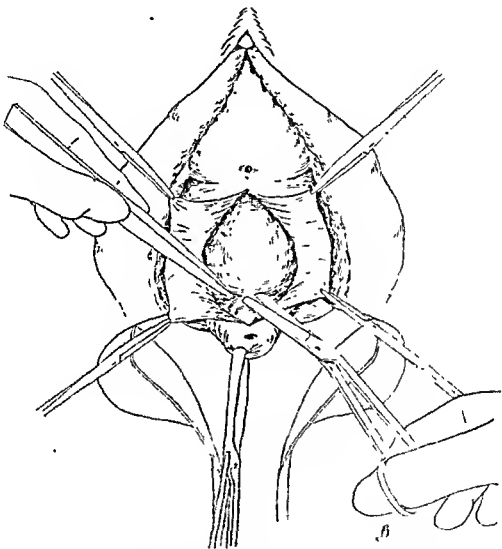


Fig. 382.—Separating the bladder from the supravaginal cervix.

When passing these sutures it is necessary to be very careful lest the bladder be transixed, and this is best avoided by using the index finger of the left hand to guard the bladder and guide the direction of the needle.

vi. *Excision of the redundant portions of the vaginal flaps.*—The ridge of vaginal wall resulting from the approximation of the mattress-

sutures is usually unnecessarily large, and should therefore be reduced with the scissors (Fig. 385).

vii. Suture of the cut edges of the vaginal flaps.—The raw edges of the vaginal flaps are lastly united by interrupted sutures of No. 1 catgut (Fig. 386).

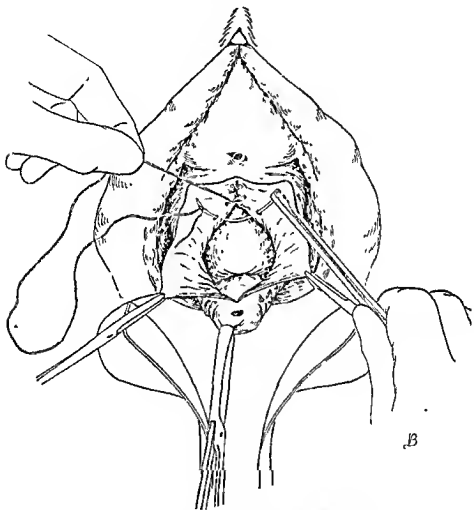


Fig. 383.—Suture of the sub-vesical (pubo-cervical) fascia.

Alternative method.—Instead of suturing the sub-vesical fascia separately, it can be included in the mattress-sutures that make the buttress. The result is the same.

Dangers. i. Injury to the bladder or ureters.—We have already pointed out that care must be taken, when passing the mattress-sutures,

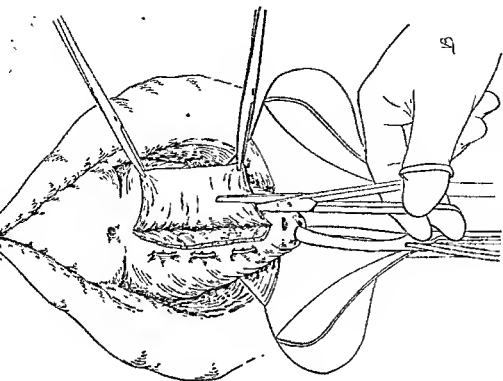


Fig. 385.—Trimming the flaps.

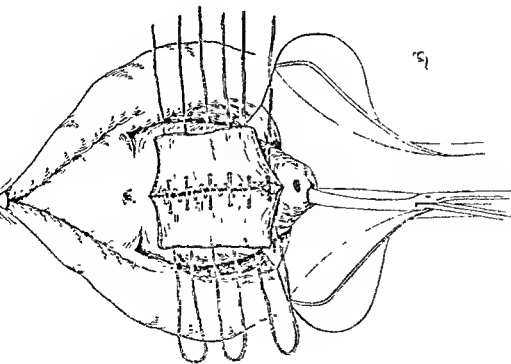


Fig. 384.—The mattress-sutures inserted.

not to injure the bladder. If the operator is in any doubt as to the position of this viscus he should define it by means of the bladder-sound.

The ureters are less likely to be injured than the bladder if the technique we have described is followed, but when the vaginal flaps have been very widely separated, it would be possible to include one or both ureters in a mattress-suture.

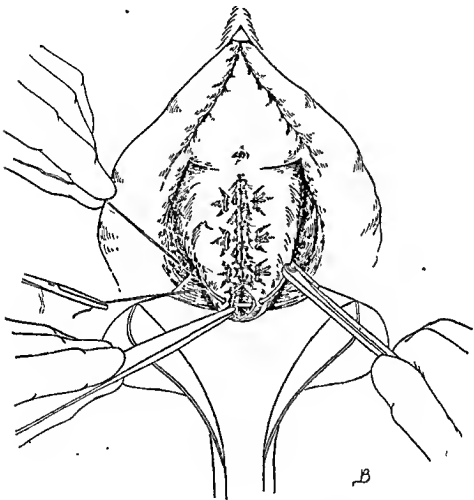


Fig. 386.—Suture of the edges of the flaps.

We have abandoned the use of a purse-string suture to tauten the sub-vesical fascia because it tends to pull the cervix too close to the back of the pubic symphysis. Moreover, we have knowledge of several cases in which the insertion of such a suture included one or both ureters. If both ureters are caught there will not be any urine in the bladder,

once it has been emptied. In this case the stitches will have to be removed, and the parts again approximated.

ii. *Hæmorrhage*.—Though, as a rule, the mattress-sutures efficiently arrest all bleeding from the cut vaginal wall, profuse bleeding may occur from one or more of the large veins somewhat laterally placed between

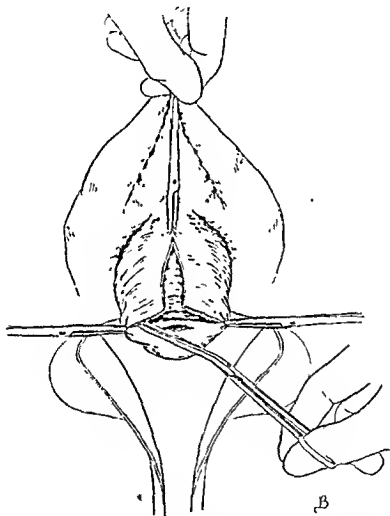


Fig. 387.—The operation for vault prolapse: Making the first incision.

the vaginal wall and the bladder. These veins may not be included in the grip of the mattress-sutures, and if they have been left unligatured a very large hæmatoma may form, which forces its way upwards until it reaches the cellular tissue lying beneath the peritoneum of the utero-vesical pouch. Violent symptoms are produced, the pulse becoming very fast, the patient presenting a very pale and shocked appearance

and complaining of great pain. On examination a tumid swelling will be found bulging in the whole of the anterior vaginal wall, and in bad cases has been felt from the abdomen. In such an event the sutures must be removed, the wound opened up and the bleeding-points sought

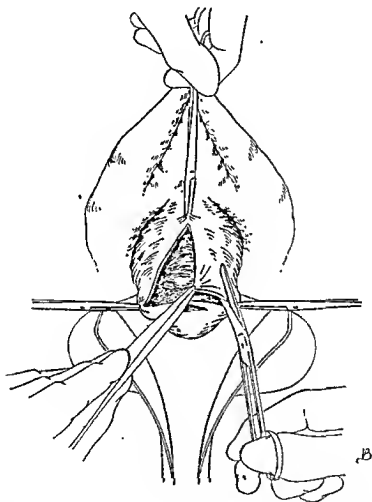


Fig. 388.—The operation for vault prolapse: Excising portions of the anterior vaginal wall.

and ligatured. Such a happening is a disaster, since it is almost certain to be followed by infection and suppuration.

iii. Sepsis.—If the operative technique has been good and the ligature material irreproachable, septic infection is unlikely. The predisposing cause is hæmorrhage, as already described. See p. 522.

Dressing and after-treatment.—For the general lines of after-treatment, see Chapter xxx. The patient may get up on the 18th day. She should be careful for some months following the

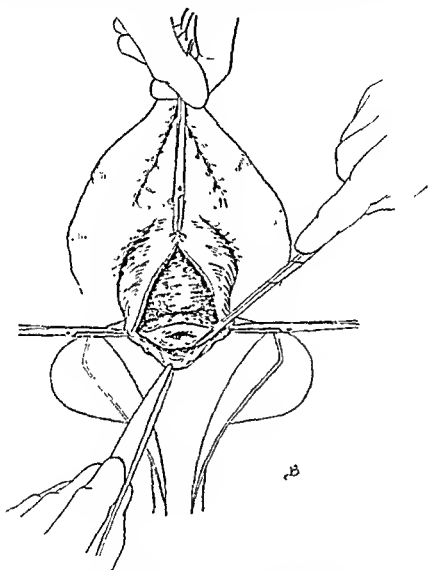


FIG. 389.—Making the posterior incision.

operation not to resume any occupation which causes straining, as until the parts have thoroughly healed there is danger of the vaginal wall again becoming stretched.

THE OPERATION FOR VAULT PROLAPSE

The operation about to be described is in essentials the one described

by Fothergill, but we do not exactly follow that technique. The credit for originally devising the principles of vaginal repair belongs to Donald of Manchester. This gynæcologist greatly advanced the plastic surgery of the vagina.

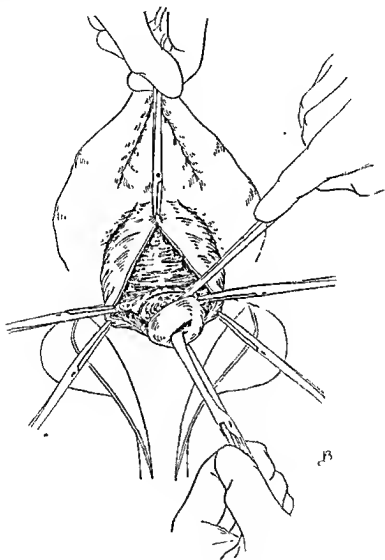


Fig. 390.—Amputating the cervix.

Operation. i. Applying the marking forceps.—The cervix having been pulled down so as fully to expose the prolapse, a pair of forceps is applied to the lateral vaginal vault outside the cervix and 1 to 1½ inches

from the external os on both sides. These points are known as Fothergill's points. A third pair of forceps is now applied to the anterior vaginal wall in the mid-line, its exact position depending on the amount of vaginal wall it is necessary to remove. When only the vault is down,

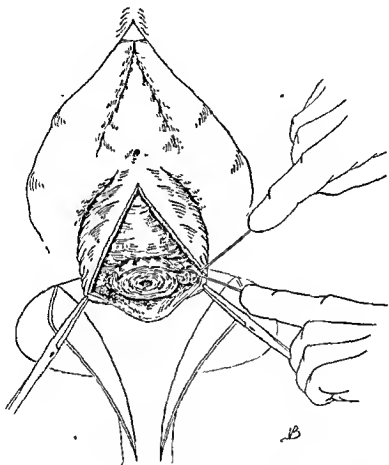


Fig. 391.—Ligature of the lateral cervical vessels.

an inch from the cervix is sufficient, but if there is cystocele as well, the forceps must be applied at the lower limit of the bulge.

ii. *Splitting the anterior vaginal wall.*—The anterior vaginal wall is now split in the middle line in the manner described under anterior colporrhaphy on p. 534 (Fig. 380).

iii. *Making the lateral incisions.*—From the cervical end of the incision splitting the anterior vaginal wall, a transverse incision is carried out on each side to Fothergill's point (Fig. 387). The incision should pass through the vaginal wall only.

iv. Separating and removing a portion of the vaginal wall.—The vaginal wall on each side of the central incision is now reflected off the supravaginal cervix and the bladder, after which the separated

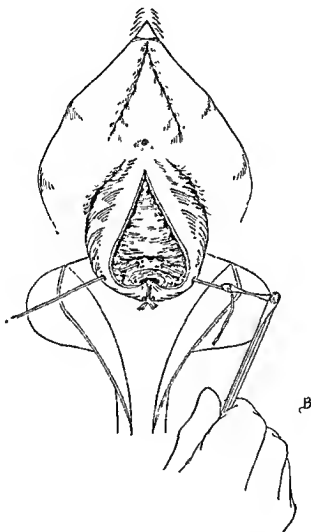


Fig. 392.—Inserting Fothergill's suture.

portions (Fig. 388) may be at once excised, but there is an advantage in postponing this step until the cervical part of the operation is concluded, for the time during which blood may ooze from the cut edges is thereby lessened.

v. Separation of the bladder from the supravaginal cervix.—The

bladder is now separated from the supravaginal cervix by swab-pressure aided by snips with the scissors, in the manner described in the operation of anterior colporrhaphy.

vi. Making the posterior incision.—Starting at Fothergill's point on

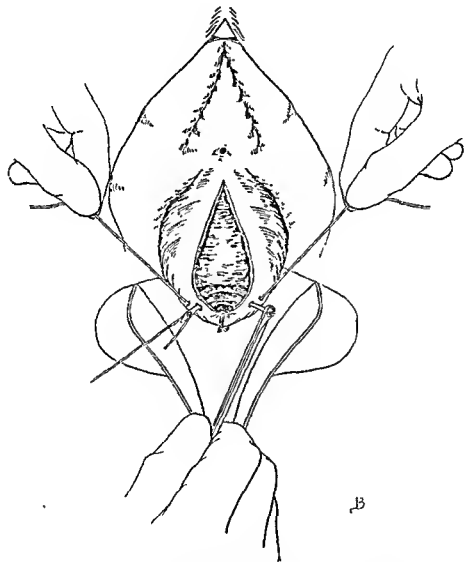


Fig. 393.—Inserting the suture forming the anterior boundary of the new external os.

one side, an incision is now carried round the back of the cervix between the forceps to Fothergill's point on the other side and a flap of posterior vaginal wall is reflected down (Fig. 389).

vii. Amputating the cervix.—A pair of Spencer Wells forceps is now applied immediately lateral to the cervix on each side. The lateral

cervical vessels are thus controlled. The cervix is then amputated at the level the operator considers necessary (Fig. 390). The first step is to divide the tissue inside the forceps which holds the lateral cervical vessels on each side, after which the cervix itself is cut across. The exact amount of cervix to be removed depends on whether it is elongated or not. If it is, an inch or more must be taken away; if not, half an inch may suffice.

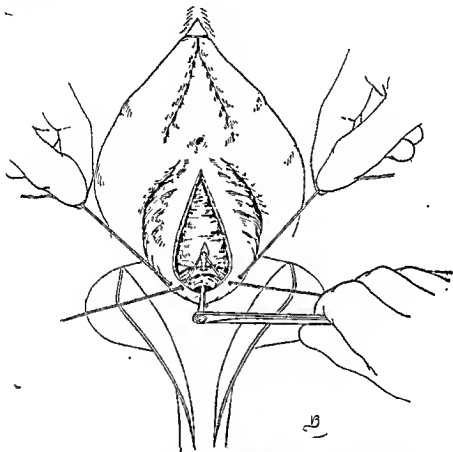


Fig. 394.—Pulling through the cervix the suture which completes the external os.

viii. **Ligature of the lateral cervical vessels.**—The forceps on the lateral cervical vessels are now replaced by transfixion ligatures (Fig. 391).

ix. **Approximating the posterior vaginal flap to the posterior surface of the cut cervix.**—The posterior flap is now attached to the margin of the cervical canal by Bonney's approximating suture, as described under amputation of the cervix (*see* p. 199). In some cases simple interrupted sutures will suffice.

x. Inserting Fothergill's suture.—A suture is now inserted, passing through the vaginal wall from Fothergill's point on one side, picking up the substance of the front of the supravaginal cervix *en passant* to Fothergill's point on the opposite side. The suture is passed deeply on either side so as to include the upper fibres of the cardinal ligaments as they spread out from the supravaginal cervix and, having been passed, is left untied with a forceps on either end of it (Fig. 392).

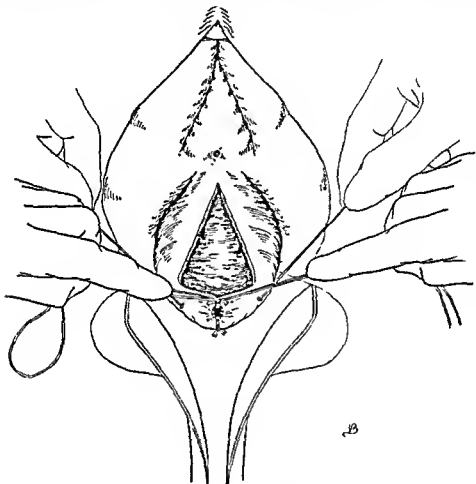


Fig. 395.—Tying the suture that completes the external os.

This suture will fasten the paracervical tissue to the front of the cervix.

xi. Fashioning the new external os.—A suture is now passed through the vaginal wall on each side, close to its cut edge and internal to the points at which Fothergill's suture emerges (Fig. 393). Reverdin's needle is now passed up the cervical canal and the point is made to perforate the anterior wall of the cervix (Fig. 394). A loop of the suture just passed is then inserted in the eye of the needle and drawn back. This loop is

now tied to the two free ends of the same suture, with the result that the vaginal wall is firmly fixed to the anterior circumference of the orifice of the cervical canal, and a new external os is thus fashioned (Fig. 395).

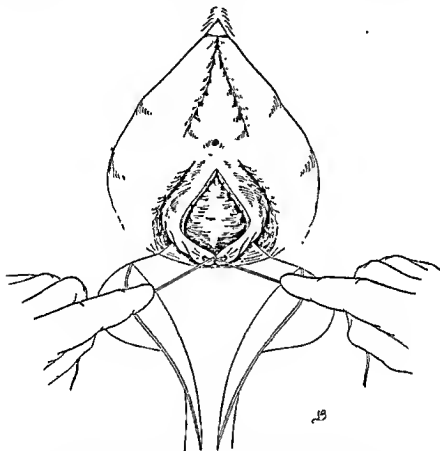


Fig. 396.—Tying Fothergill's suture. In practice, the cervix should be pushed as far up as possible while the knot is tied.

An alternative method is to pass the suture through the vaginal edge on one side, then through the cervical tissue into the canal, and out again through the cervical tissue, and finally through the vaginal wall on the other side, and tie the two ends. This suture, however, is not so strong.

xii. Tying Fothergill's suture.—This suture is now tied, with the result that Fothergill's points are approximated in front of the cervix. The cervix is pushed backwards and upwards during the tying, the upper fibres of the cardinal ligaments being brought together in front of the cervix and thereby tightened (Fig. 396).

xiii. Suturing the anterior vaginal wall.—If the flaps of the anterior

ginal wall have not yet been cut away, this should now be done, the amount removed depending on the degree of redundancy of the vaginal wall. The gap in the anterior vaginal wall is closed by interrupted sutures reinforced, perhaps, by a few mattress-sutures, as the operator

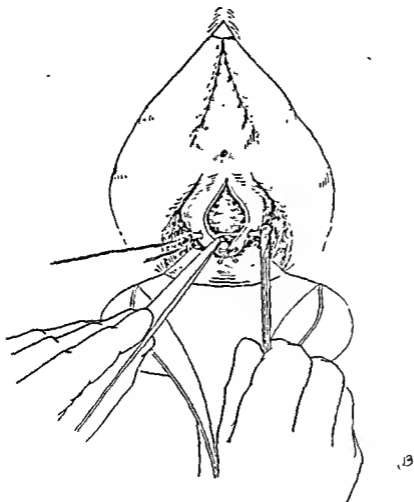


Fig. 397.—Suture of the anterior vaginal wall.

thinks best suited to the case (Fig. 397). When the anterior vaginal wall is very long and its lower end redundant, it is best to close the lower end of the incision so that in this part of it the suture line is transverse.

xiv. Completion of the operation by colpo-perineorrhaphy.—This is an essential step in any operation for vault prolapse, for the vaginal outlet is always more or less relaxed in these cases (see p. 514).

Dressing and after-treatment.—For the general lines of after-treatment, see Chapter xxx. Since the cervix is amputated, there is the

same liability to secondary hæmorrhage as described on p. 205, and the patient should stay in bed for 18 days.

Dangers.—The dangers are the same as those already described under anterior and posterior colporrhaphy. There is, however, a special risk in the operation for vault prolapse of including either one or both of the ureters when inserting Fothergill's suture. This accident can be

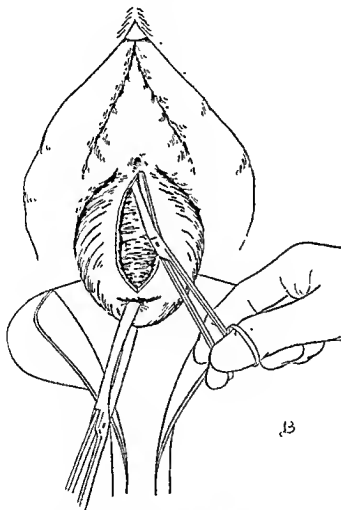


Fig. 398.—Le Fort's operation: Splitting the anterior vaginal wall.

avoided by free separation of the bladder, not only in the mid-line but also outwards.

POSTERIOR VAULT PROLAPSE

This is a true hernia of Douglas's pouch, and the protrusion contains a peritoneal sac in which small intestine may be lying. These cases may

be treated either by posterior colporrhaphy extended to the top of the vagina, or by Fothergill's operation extended backwards. In either case the peritoneal sac must be opened to see that there is no intestine in it. The sac can then be dissected free and ligatured or inturned by a series of purse-string sutures. In very obstinate cases it may be necessary

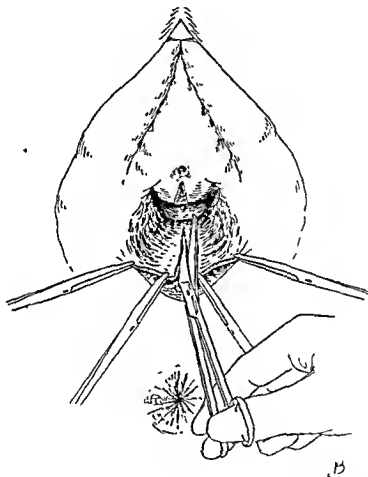


Fig. 399.—Splitting the lower part of the posterior vaginal wall.

to remove the abdominal pressure from the posterior pelvis by obliterating Douglas's pouch through an abdominal incision. (See p. 607.)

LE FORT'S OPERATION FOR COMPLETE PROLAPSE

By this operation the prolapse of the vagina is cured by converting the vagina into two narrow canals parallel to one another, the calibre

of each canal relative to the thickness of its walls being too small to allow of its turning inside out. The median septum formed between the two canals acts as a support preventing descent of the bladder and rectum. When properly carried out, the procedure gives a very lasting and strong result.

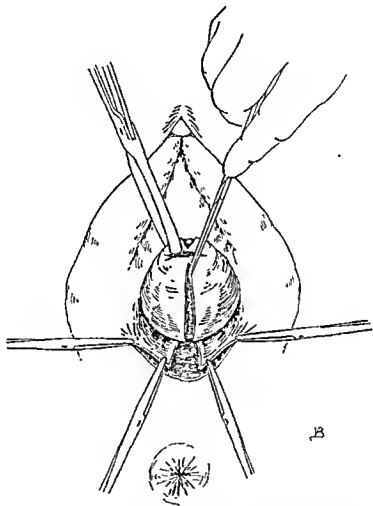


Fig. 400.—Splitting the upper part of the posterior vaginal wall.

It is a less severe operation than the operation for vault prolapse already described, and hence is peculiarly applicable to feeble old women.

This operation is suitable only for performance on women in whom the question of the advisability of maintaining the vagina in a condition suitable for marital relations can be answered absolutely in the negative. Its application is, therefore, limited almost entirely to old women. It is

specially applicable to cases of complete extroversion of the vagina in which anterior and posterior walls are equally prolapsed, and in which the uterus has already been removed, or in which, though present, it is greatly atrophied. It is not suitable for cases where the bulge chiefly or entirely affects one wall, but sometimes it can be usefully applied to hold up a prolapsed vault, the lower portions of the prolapse being treated by anterior and posterior colporrhaphy.

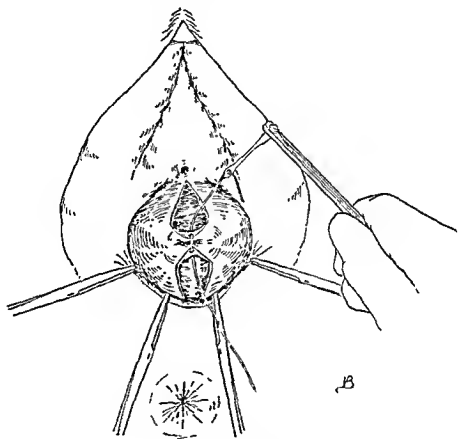


Fig. 401.—Suture of the upper nplies of the incisions.

Operation. i. Separating and incising the anterior vaginal wall.—The uterus having been pulled outside the vulval orifice with a volsellum, the anterior vaginal wall is separated from the bladder, and the vaginal wall is split in the middle line along its whole length in the same manner as already described under anterior colporrhaphy, and similarly the edges of the incision are freed on either side from the bladder (Fig. 398). The freeing should extend about three-quarters of an inch on each side to allow the edges to be inturnd into the vagina.

ii. Separating the posterior vaginal wall.—The extroverted vagina having been pushed back, the next step of the operation consists in separating the posterior vaginal wall from the perineum and recto-vaginal septum in the manner already described under colpo-

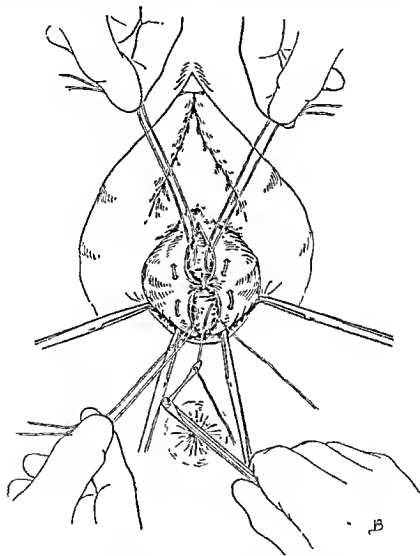


Fig. 402.—Inserting the first four mattress-sutures.

perineorrhaphy (p. 514 and Figs. 356, 357 and 358). The junction of the perineal skin and mucosa is cut away between forceps and the vaginal wall is separated, first by scissors and afterwards by the finger.

The separation and division of the posterior wall, unlike the same procedure on the anterior wall, cannot be carried out by a single incision,

since this wall cannot all be exposed at once. It must therefore be separated and divided in two stages.

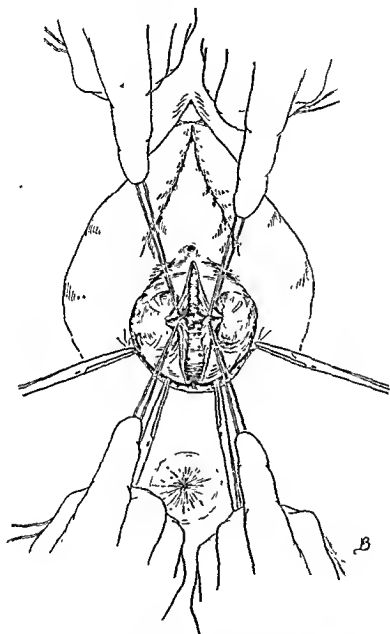


Fig. 403.—Tying the first four mattress-sutures.

iii. Splitting the posterior vaginal wall.—The lower half of the posterior vaginal wall is now split upwards in the middle line (Fig. 399). The uterus is then pulled out and the incision in the posterior vaginal wall is carried up to within half an inch of the external os and its edges freed (Fig. 400).

iv. Approximation of the apex of the anterior incision to the apex of the posterior incision.—The suture is passed through the raw surface at the upper angle of each incision so that when tied the raw surfaces of the vaginal walls are brought in contact (Fig. 401). The cervix must be pushed right up while this suture is tied. When this is done, the os will have disappeared from view.

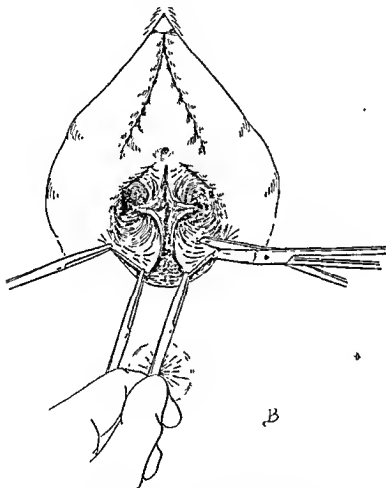


Fig. 401.—The double vagina fashioned: Excising a wedge from the lower end of the posterior vaginal wall.

v. Insertion of the first four mattress-sutures.—Four mattress-sutures are now inserted as follows. With their loops on the vaginal surface, two perforate the anterior wall on either side of the incision in it, and $\frac{1}{2}$ -inch from the edges of it, and two perforate the posterior wall in the same manner (Fig. 402).

vi. Tying the mattress-sutures.—The two loose ends of the right-

hand mattress-suture in the anterior wall are now tied to the two loose ends of the right-hand mattress-suture in the posterior wall, and similarly on the opposite side.

The object of this method of suture is to *turn the edges into the lumina of the two vaginae* which it is the object of the operation to

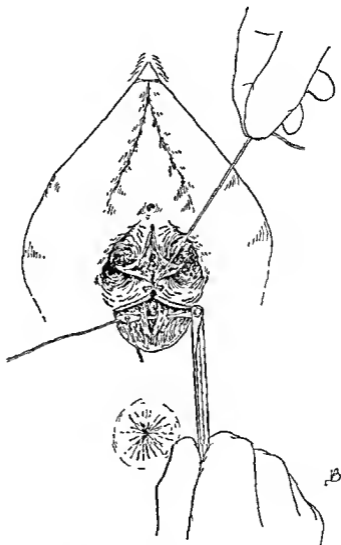


Fig. 405.—Suture of the Levatores ani.

construct. The knots are on the raw surface and are cut short (Fig. 403). Since four threads are used, the knot is bulky, and No. 0 cat-gut is therefore better than No. 1.

vii. Further insertion of mattress-sutures.—A further series of such

sutures is then inserted following along the raw edges of the anterior and posterior incisions and about $\frac{1}{2}$ in. from them, and this procedure is continued until the entire length of the anterior incision has been used up, by which time it will be found that a couple of parallel canals

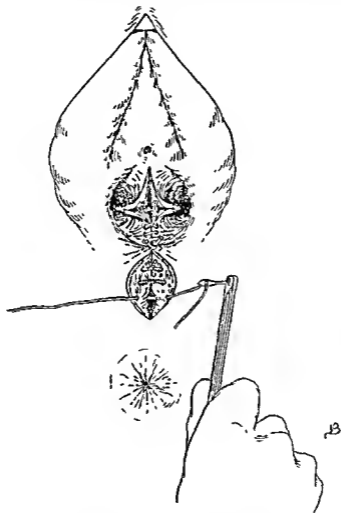


Fig. 406.—Suture of the superficial fasciæ.

have been constructed, separated from one another by a broad median septum, with the vaginal edges turned into the lamina.

viii. Restoring the perineum.—Since the posterior vaginal wall is invariably longer than the anterior vaginal wall, it will be found that after the two parallel canals are completed, a portion of the lower end of the posterior vaginal wall remains untaken up. Wedge-shaped

portions of this are now removed on either side of the median split and the raw edges are brought together with a continuous catgut suture, in the same manner as already described under colpo-perineorrhaphy (p. 514) (Fig. 404). The suture is continued downwards for the distance

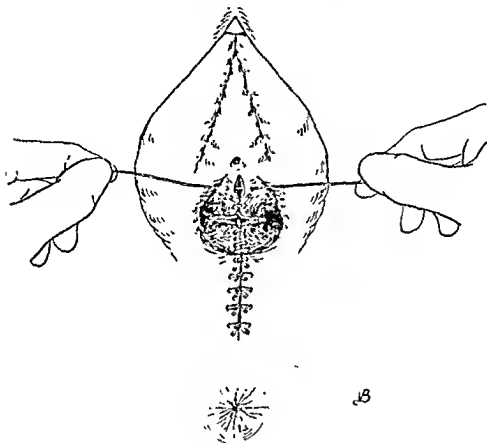


Fig. 407.—Final sutures.

of a stitch or two until the level of the levatores ani is reached, when the suture is discontinued while the edges of the levatores ani are brought together in the manner already described under colpo-perineorrhaphy (Fig. 405). The vaginal suture is then continued downwards to the vaginal orifice and there tied.

After this the superficial fascia is brought together by buried sutures (Fig. 406) (see p. 514).

Finally, the perineal skin having been united by interrupted sutures, the operation is completed by inserting a few further catgut sutures to close the small deficiency which usually remains in the anterior vaginal wall (Fig. 407).

The calibre of each half of the double vagina which has been constructed is generally large enough to take the little finger, but if smaller it does not matter.

Dressing and after-treatment.—See p. 24 and Chapter XXX.

Difficulties and dangers.—The operation is a simple one, with practically no risk if the technique described is carried out properly. It is important to free the vaginal walls thoroughly, not only in the

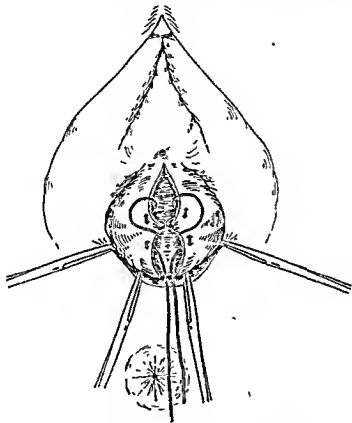


Fig. 408.—Le Fort's operation: Alternative method using two continuous sutures.

middle line but for some distance on each side, otherwise there will be undesirable tension on the sutures. It will be noted that no parts of the anterior and posterior vaginal walls that are going to form the median septum are cut away. The redundancy is utilized for the inturning of the edges, by which means the septum is made very broad and strong. Simply to suture the edges together gives a very weak result. The patient should stay in bed for 21 days.

Alternative method of suturing.—Instead of using interrupted mattress-sutures to form the two canals, a single continuous suture on each side may be employed. The method of its insertion is as follows. The two ends of the first suture, used to bring the upper apices of the two incisions together, are *not* cut short as in the preceding method, but are left long. Each end of the suture is then passed through the anterior vaginal wall from within the split outwards, then back

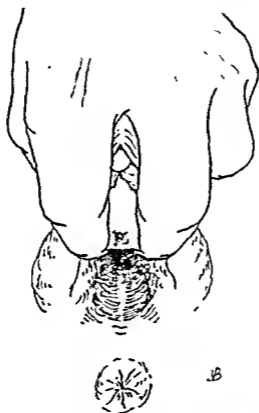


Fig. 409.—The operation for stress incontinence: The test for the efficacy of the operation.

through the anterior vaginal wall from without inwards, then through the posterior vaginal wall from within the split outwards and then through the posterior vaginal wall from without inwards (Fig. 408). By this manœuvre loops of suture show on the vaginal surfaces in the same way as obtains when interrupted mattress-sutures are employed. After the sutures have been inserted in the way described, traction is made upon them, with the result that the edges are out-turned in to the lumen on each side; this being effected, a knot is tied, after which the procedure is continued along the length of the incision until the whole

length of the anterior incision has been used up, when the two ends are tied finally. This is a quicker method than that first described, and leaves no dead space between the walls of the septum, but the inturning is less accurate.

THE BONNEY-WORRALL OPERATION FOR STRESS INCONTINENCE

Indication.—The condition of partial incontinence of urine, known

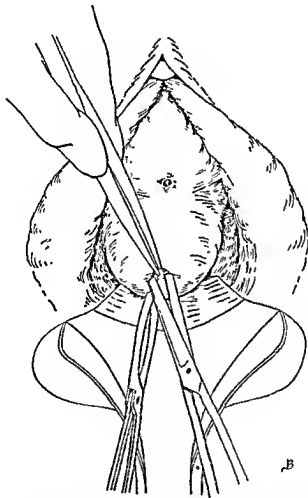


Fig. 410.—The operation for stress incontinence: Incising the anterior vaginal wall.

as stress incontinence, is due to a disturbance of the sphincteric mechanism of the neck of the bladder and follows upon childbirth, but usually so slowly that it is some years before it has become sufficiently

troublesome to make the sufferer seek relief. The incontinence does not occur while the woman rests or keeps quiet, but any jerky movement or strain, such as laughing, crying, tennis, golfing, dancing, or walking downstairs, causes a gush of urine to escape past the imperfect sphincter, much to her discomfort and disability. The condition

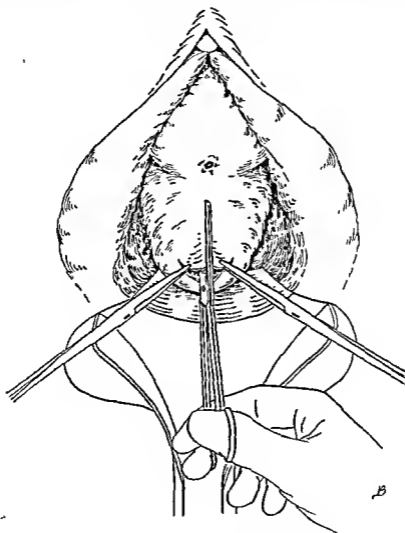


Fig. 411.—Splitting the anterior vaginal wall.

is nearly always accompanied by a characteristic displacement of the lower end of the anterior vaginal wall.*

The best cure for the generality of these cases is the operation devised by one of us (V.B.) and independently by the late Ralph Worrall of Sydney. Before deciding upon it the following test should be applied. The patient, whose bladder should not recently have been emptied, is

* Victor Bonney, *Jour. of Obst. and Gyn. of Brit. Emp.*, Vol. XXX, No. 3, 1923 and *Brit. Jour. of Urology*, No. 1, Vol. 1, 1929.

told to cough violently and the escape of urine noted. The index and middle finger of the examiner's hand should now be inserted into the vagina and the anterior vaginal wall pressed against the subpubic angle,

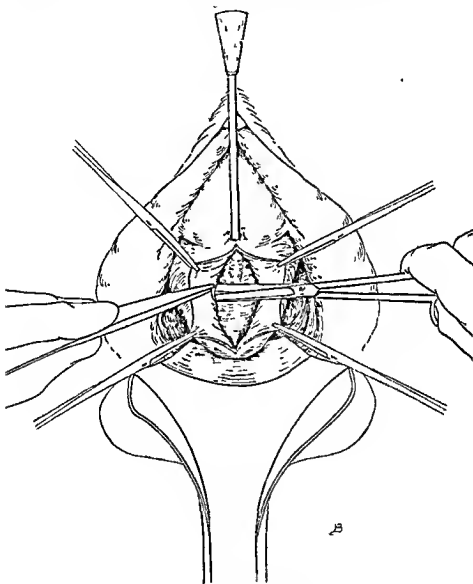


Fig. 412.—Reflecting the flaps.

but without pressing on the urethra (Fig. 409). The patient is now told to cough again. If the pressure of the fingers prevents the leak, the operation if properly carried out should cure her.

Preparation of the patient.—See p. 76.

Instruments.—Those for colpo-perineorrhaphy (see p. 514).

Operation.—The steps are as follows:

i. Exposing the urethra.—The anterior vaginal wall is pulled down

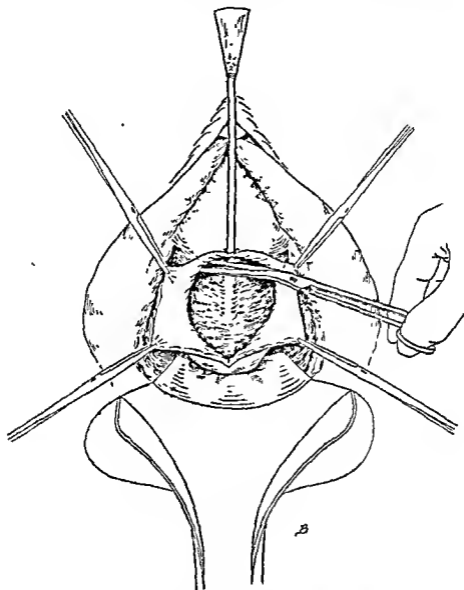


Fig. 413.—Continuing the reflection of the flaps.

by a volsellum fixed just above the point that corresponds to the vesical sphincter, i.e. about 2 inches up the vagina. The vaginal wall, having been put upon the stretch, is then incised with scissors transversely for $\frac{1}{2}$ an inch immediately below this point (Fig. 410).

A pair of pressure forceps is now attached to the cut edge of the vaginal wall on each side of the middle line, and one blade of the scissors is then gently inserted along the plane of cellular tissue between the

anterior vaginal wall and urethra, to within $\frac{1}{2}$ inch of the urethral opening.

The vaginal wall is now divided with scissors in the middle line almost to the meatus, and the edges are separated outwards on either side assisted by two pairs of pressure forceps applied to the cut edges (Fig.

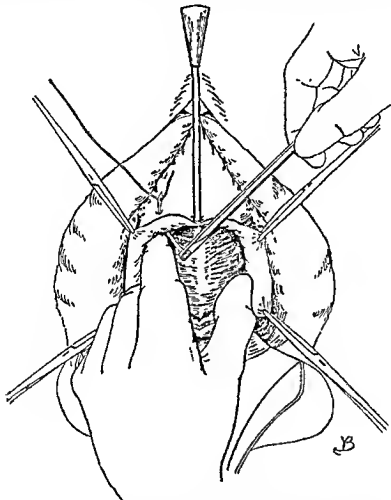


Fig. 414.—Drawing the first limb of the first mattress-suture through the left-hand flap.

411). The whole length of the urethra is thus exposed, and it is made clearer by inserting a sound. The flaps of vaginal wall are then further separated by scissor snips (Fig. 412).

ii. Inserting the first mattress-suture.—As we originally described the operation, the surgeon, after exposing the urethra, proceeded to overfold it by drawing together in the middle line the tissues lying lateral to it. Though this procedure was generally satisfactory, there

were cases in which the tissues were so thin and weak that not much support could be obtained this way, and therefore we have for some years relied on a series of mattress-sutures to give the result aimed at—namely, to press the urethra back into the subpubic angle. The cause of the incontinence is the dropping away of the wedge of tissue which contains the urethra from this angle.

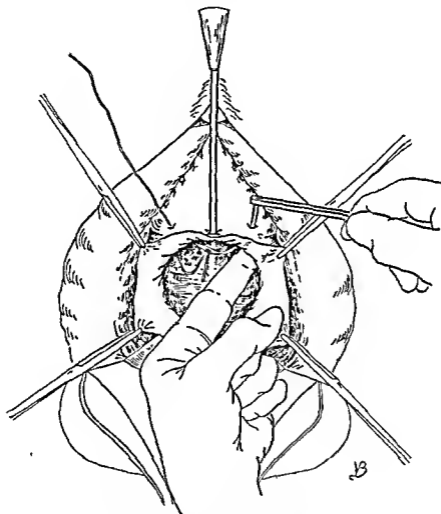


Fig. 415.—Drawing the first limb of the first mattress-suture through the right-hand flap.

In order, however, to effect this, it is necessary to dissect far outwards on either side and to carry this dissection so far forwards that the upper part of the spaces opened up are lateral to the meatus itself (Fig. 413). The dissection is effected by scissors and, when complete, a space large enough to put the tip of the finger in should exist on either side of the lower urethra and the meatus (Fig. 414).

The mattress-sutures are now inserted, and of them the lowermost (i.e. that nearest the meatus) is the most important. It is passed as follows. Guided by the tip of the index finger of the left hand inserted into the space dissected on the patient's right side of the meatus, the Reverdin's needle is inserted through the space and brought out on

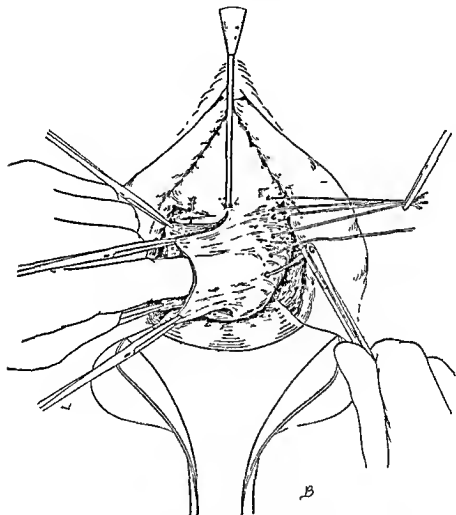


Fig. 416.—Insertion of the mattress-suture needle passed through the left flap.

the vestibular surface about $\frac{3}{4}$ inch outside the meatus and slightly above the level of its anterior margin, and a strand of catgut is drawn through (Fig. 414). The needle is now inserted through the vestibular surface on the patient's left side, about $\frac{3}{4}$ inch outside the meatus and on a level with its anterior margin, and made to emerge through the space

that has been dissected on the patient's left side of the meatus and urethra. The catgut already drawn through on her right side is now drawn through on the left side (Fig. 415). The second limb of the mattress-suture is then passed in the same way and the suture is left untied with a forceps attached to its free ends.

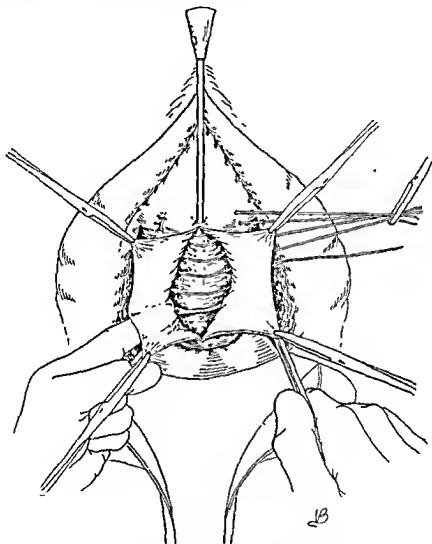


Fig. 417.—Insertion of the subsequent mattress-sutures. Needle being passed through the right flap.

iii. Passing the rest of the mattress-sutures.—These are passed as shown in Figs. 416 and 417, the needle being passed through the base of the vaginal flap on the patient's left, while the index finger of the left hand guards the bladder from injury; and then through the base of the flap on her right, each limb of each suture entering and emerging at least 1 inch from the edges of the flaps.

iv. Tying the mattress-sutures.—By means of a sound in the bladder, an assistant presses the urethra into the subpubic angle, while another assistant pulls the flap on the patient's left side well across to her right

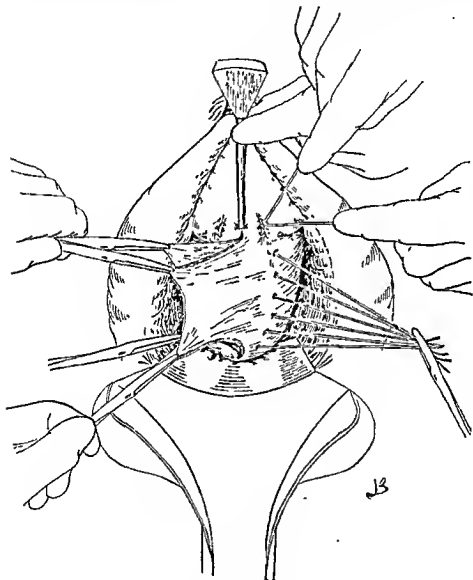


Fig. 418.—Tying the first mattress suture.

side and, with the parts in these positions, the operator ties first the suture nearest the meatus and afterwards the remaining sutures in order (Fig. 418).

v. Trimming the flaps.—If the flaps are redundant, a portion should

be cut off in the same manner as described in anterior colporrhaphy but in many cases trimming is not required (Fig. 419).

vi. Final sutures.—The edges of the flaps are now brought together with interrupted catgut sutures (Fig. 420).

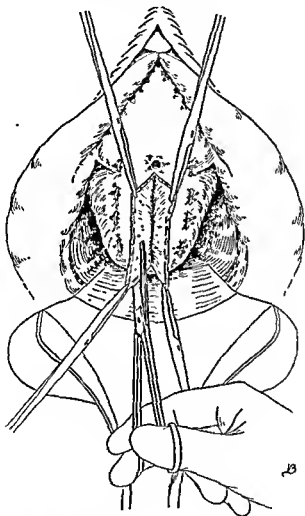


Fig. 419.—Excising portions of the flaps.

Difficulties.—If the sutures are placed as described, and a sound is kept in the canal during the operation as a guide it is impossible unduly to constrict the urethra.

After-treatment.—See Chapter xxx. Retention of urine for a few days after the operation is usual and, indeed, signifies that the operation has been efficiently performed. The bladder will need catheterization if this occurs. Such retention augurs well for the success of the operation. The patient should be kept in bed for 16 days.

Urotropin, gr. x, t.d.s., should be given as a precaution against cystitis.

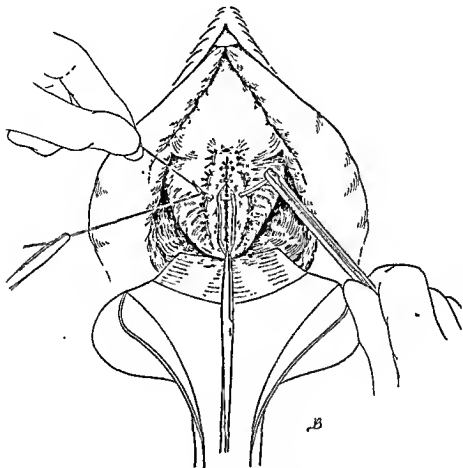


Fig. 420.—Final suture of the flaps, suturing the edges.

FASCIAL SUSPENSION OF THE URETHRA

Indications.—The operation just described is a very successful one if carried out properly. The common fault is not to continue the mattress-suturing right down to the meatus. Nevertheless there is a proportion of failures, estimated at about 20 per cent.; mostly because after a period of relief the stress incontinence recurs, but sometimes because no relief at all follows the operation.

For such failures and also for those rare cases where stress incontinence is not accompanied by any visible displacement of the parts,

fascial suspension of the urethra is indicated. This operation, of continental origin, has been practised by *Chassar Moir* in this country and by *Aldridge* in the United States with success, but recently *Terrence Millin* has invented an improved technique whereby the operation is carried out entirely through an abdominal incision, instead of by the dual route. It is this operation which we shall describe.

Instruments.—See p. 274.—For pulling the fascial strips under the urethra an aneurysm forceps (*Fig. 421*) is the best instrument to use.

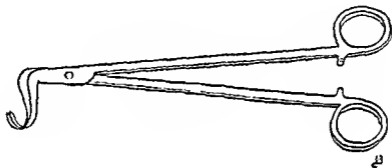


FIG. 421.—Aneurysm forceps.

Preparation of the patient.—See p. 78. The vagina should be packed with half-strength Violet-green (see p. 32), so as to raise the urethra and give the operator a firm background against which to separate it from the anterior vaginal wall. A stiff No. 8 Malecot self-retaining catheter is passed into the bladder.

Operation. i. The skin incision.—This should be transverse curving cephalwards at either extremity and distant from the pubic bone about $1\frac{1}{4}$ inches. It should extend to about $1\frac{1}{2}$ inches from the anterior superior iliac spine on either side.

ii. Reflecting the skin.—The skin above and below should be separated from the fascia for about 1 inch.

iii. Incising the fascia.—This incision, which should extend the full length of the skin incision, is made somewhat curved with the convexity cephalward.

iv. Separating the fascia.—The fascia both above and below the incision in it is undermined and raised from off the underlying muscle (*Fig. 422*).

v. Cutting the strips.—Starting at one end of the fascial incision a strip of the fascia above the incision is cut by scissors up to about the

position of the outer border of the rectus; i.e. about 1 inch from the opposite end of the fascial incision. The same proceeding, but in the

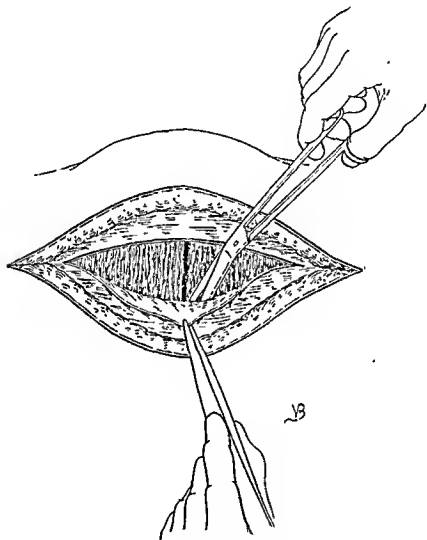


Fig. 422.—Abdominal fascial suspension of the urethra: Reflecting, the fascia.

opposite direction, is then carried out on the fascia below the fascial incision (Fig. 423).

vi. Exposing the bladder.—The recti are now separated, exposing the surface of the bladder below the reflexion of the peritoneum.

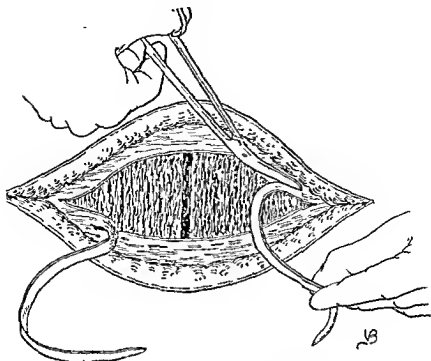


Fig. 423.—Cutting the fascial strips.

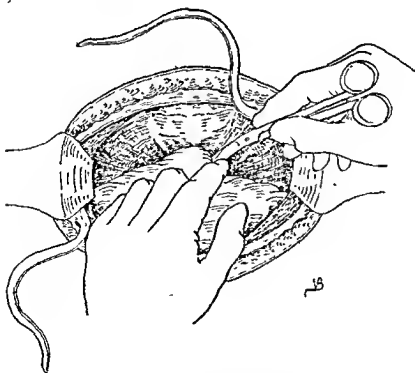


Fig. 424.—Separating the urethra.

vii. Gaining access to the urethra.—The fat and fibres of the cave of Retzius are now displaced by the finger and swab until the bladder is entirely separated from the back of the bony pubis.

viii. Separating the urethra.—Working with the finger, the end of a blunt pointed scissors, and the point of the aneurysm forceps, the urethra is now separated from the anterior vaginal wall (Fig. 424). This is facilitated by the stiff catheter in the urethra and the firm background of the vaginal packing. When the urethra is sufficiently separated the

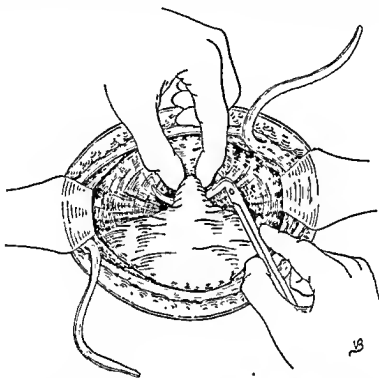


Fig. 425.—Passing the aneurysm forceps under the urethra.

operator can pick up it and its contained catheter with his finger and thumb and complete the separation by passing the aneurysm forceps under it (Fig. 425).

ix. Passing the fascial strips through the rectus muscle.—The aneurysm forceps is now made to perforate the outer edge of the rectus muscle on one side, from within outwards, and having seized the end of the fascial strip corresponding to that side, the forceps is withdrawn bringing the strip with it (Fig. 426). The same proceeding is then carried out on the other side.

x. Drawing the strips under the urethra.—The aneurysm forceps is passed afresh under the urethra from right to left and the strip taking off from the left side is seized and drawn back under the urethra

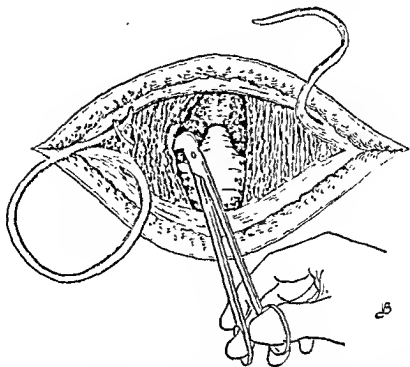


Fig. 426.—Bringing the strip on the left side through the rectus muscle.

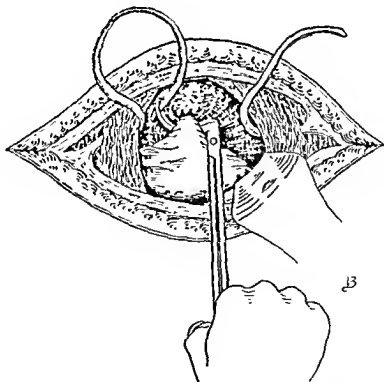


Fig. 427.—Drawing the strip under the urethra.

(Fig. 427). The forceps is then passed from left to right and the strip taking off from the right side is seized and drawn under. Traction on the ends of the strips pulls the urethra up as by a sling (Fig. 428).

xi. *Fixing the sling.*—The two strips are now sutured together just above the urethra by a No. 4 silk mattress-suture (Fig. 429). If sufficient free lengths of the strips remain these can be passed through the rectus muscle, one on each side, near their inner edges and then be sutured again in the middle line, but if much tension is required to do this the step should be omitted, remembering that the object of the

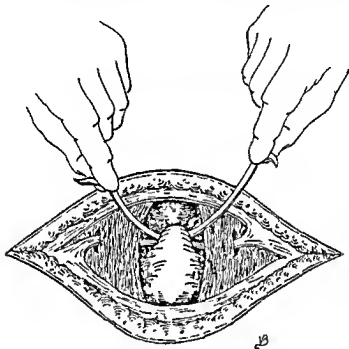


Fig. 428.—Holding up the urethra by the two strips.

operation is not so much to raise the urethra, as to prevent its descending under the intra-abdominal pressure.

xii. *Closing the incision.*—The two edges of the cut fascia are now united by interrupted catgut No. 1 sutures, the fat is brought together by interrupted plain catgut sutures and the skin united by sutures or clips.

Dressing and after-treatment.—See p. 24 and Chapter xxx. The catheter should be left in for 4 or 5 days and urotropin, gr. x, be given thrice daily.

Difficulties and dangers.—There should be very little bleeding. Veins obviously seen should be avoided or tied. The urethra lies very deep in fat women and it is possible to tear it or the bladder, in which case the hole must if possible be sutured and the cave of Retzius drained.

Probably a urinary leak will ensue but it presently closes up. Infection of the large area of cellular tissue is a serious happening and will require drainage and the usual measures against sepsis.

If the urethra is pulled up too much, retention will result after the

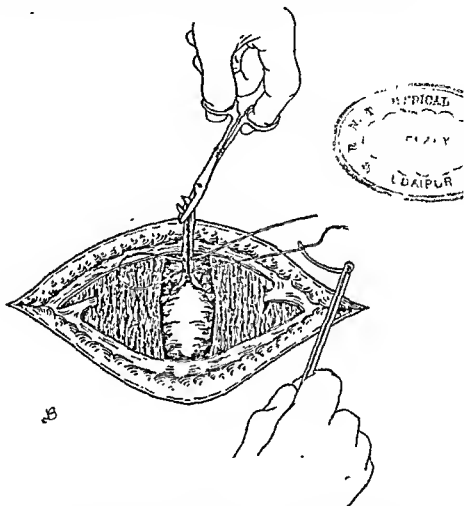


Fig. 429.—Fixing the strips above the urethra by a mattress suture.

catheter is withdrawn. Recatheterisation will be necessary and if (as in one case) this is impossible, suprapubic puncture. In this instance emptying the over-full bladder cured the retention.

INTERVESICO-VAGINAL FIXATION OF THE UTERUS

Indications.—This operation should never be performed on a woman of childbearing age unless the Fallopian tubes are tied at the same time.

Though some authorities still practise this operation we consider it inferior to the other procedures we have described for prolapse in this chapter.

Preparation of the patient.—See p. 76.

Instruments.—Those for vaginal hysterectomy (p. 243) ; but eight pressure forceps will suffice.

Operation.—The steps are as follows :

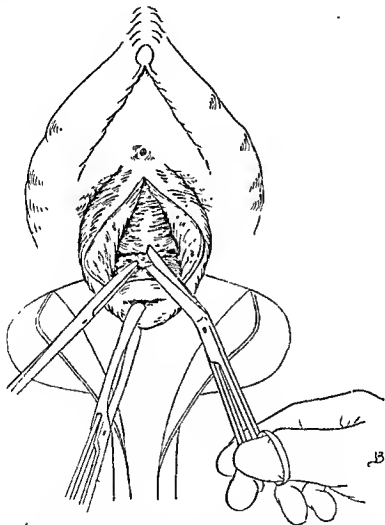


Fig. 430^a.—The interposition operation ; Opening the utero-vesical pouch.

i. **Preparation of the vagina and bladder.**—Since the operation opens up the peritoneal cavity, the vagina must be thoroughly sterilized beforehand ; Violet-green is the best antiseptic. Also, it is very important to see that the bladder is quite empty, and a catheter should be passed when the patient is on the table.

ii. **Incising the anterior vaginal wall.**—Auvard's speculum having been inserted, the procident uterus and vagina are pulled down with a volsellum fixed to the cervix, and the anterior vaginal wall is put upon

the stretch. The anterior vaginal wall is now split in the middle line along its whole length in the manner described under anterior colporrhaphy, a flap being reflected on either side.

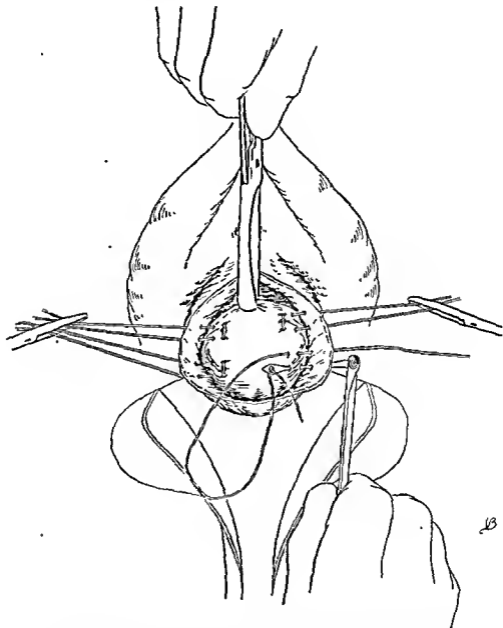


Fig. 431.—Suture of the uterus to the anterior vaginal wall.

iii. Separating the bladder and opening the utero-vesical pouch.—The bladder is now separated from the front of the supra-vaginal cervix until the peritoneum of the utero-vesical pouch is exposed. This is seized with pressure forceps and the utero-vesical pouch is opened with

scissors (Fig. 430). The opening is then enlarged by stretching it laterally with the fingers, as described under vaginal hysterectomy.

iv. Pulling down the body of the uterus.—The body of the uterus is progressively anteverted by successive grips of its anterior wall with a volsellum until the fundus is its most dependent portion and the

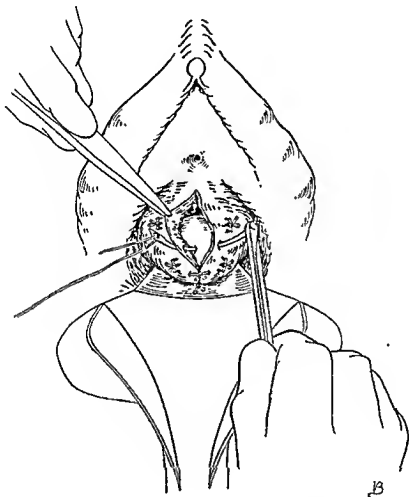


Fig. 432.—Suture of the vaginal edges.

whole length of the body has been dislocated into a position between the bladder above and the vagina below.

v. Fixing the uterus.—Four mattress-sutures are now passed, two on each side, through the base of the vaginal flaps and antero-lateral surface of the uterus (Fig. 431).

vi. Interposition sutures.—The cut edges of the anterior vaginal wall

are now closed by interrupted No. 1 catgut sutures which are passed so that each of them in the middle of the deep part of its course picks up a portion of the anterior uterine wall in its middle line (Fig. 432).

The uterus is thus fixed upside down with its anterior surface parallel to and in contact with the whole length of the anterior vaginal wall.

The operation should be concluded by colpo-perineorrhaphy on the lines indicated at p. 514.

Dressing and after-treatment.—See p. 24 and Chap. xxx. The patient should, if possible, remain in bed 3 weeks. All work involving straining should be avoided for at least 3 months.

CHAPTER XXII

OPERATIONS TO REMEDY DISPLACEMENTS OF THE GENITAL CANAL (*continued*)

ABDOMINAL OPERATIONS

VENTRALFIXATION OF THE UTERUS

Indications.—Ventralfixation of the uterus is chiefly indicated in those cases of prolapse in which descent of the vaginal vault is a marked feature. In such the uterus may be most efficiently employed as an artificial ligament to hold up the upper end of the vagina. On the other hand, the procedure is entirely useless if applied to those cases in which the displacement is an eversion of the anterior or posterior vaginal wall or a prolapsed condition of both walls. In such, colpo-perineorrhaphy and colporrhaphy are indicated. In cases of prolapse in which the vaginal vault takes a part, ventralfixation may be employed to remedy this part of the deformity, especially if retroversion co-exists. The extent of the vaginal operation is thereby lessened, which is an advantage when the patient is still young. Ventralfixation is also indicated after the removal of diseased Fallopian tubes or appendages, to prevent the post-operative retroversion and adhesion of the uterus which so commonly follow such an operation. With regard to its application to cases of retroversion uncomplicated by appendage disease, we prefer, as a rule, to shorten the round ligaments intraperitoneally, an operation more anatomically correct.

Preparation of patient.—See p. 78.

Instruments.—See p. 274.

Operation. i. Opening the abdominal cavity.—See p. 274. In this operation the peritoneal incision should not be so long as that of the fascial incision.

ii. Raising the uterus.—The uterus, which is prolapsed or retroverted, as the case may be, is brought up into the wound by the surgeon passing the first and second fingers of his left hand behind it, and then drawing it forward. If it is fixed by any adhesions, these will, of course, have first to be separated. In those cases in which the cervix has first been amputated, or repaired, the uterus should not be pulled up but its backward position alone rectified, for fear of disturbing the sutures in the cervix.

iii. Passing the sutures.—The first suture is passed through the peritoneal covering and muscle of the body of the uterus at the level of the origin of the round ligaments (Fig. 433). Each free end of the

suture is then passed through the peritoneum and fascia above the upper end of the fascial incision (Fig. 434). The object of this suture is to bring the top of the uterus above the top of the peritoneal incision and so prevent any chance of bowel or omentum becoming adherent to the

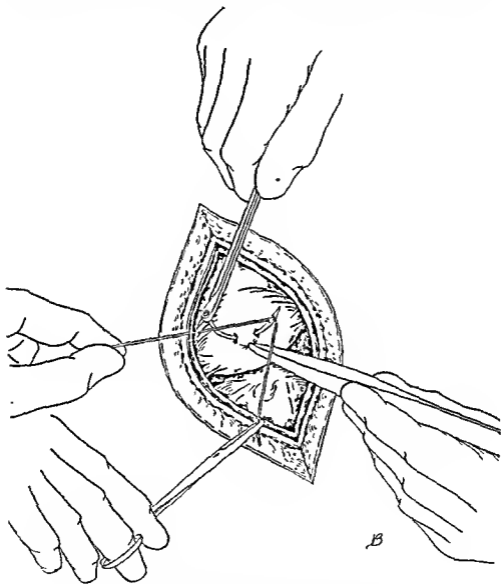


Fig. 433.—Ventral fixation: Passing the first fixing suture through the uterine wall.

scar just above where the uterus is fixed, a happening not uncommon if this step be neglected. This suture is then tied. Two or three sutures are now passed through the fascia and peritoneum of the left side, then through the peritoneum and muscle of the uterus, and lastly through the peritoneum and fascia of the right side (Fig. 435). These sutures are then tied (Fig. 436).

Silk and not catgut should always be used for the fixation sutures, for the presence of the very slowly absorbable silk promotes the formation of strong fibrous tissue at the surface of contact between the uterine and abdominal walls. Such fibrous union is to be desired. If, on the other hand, catgut be employed, a light union of weak connective tissue is all that results (postage-stamp adhesion) even if the uterus be brought

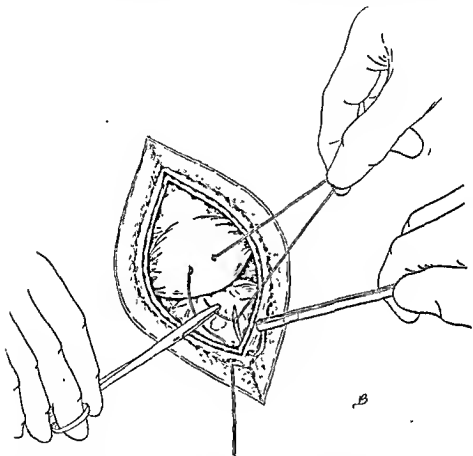


Fig. 434.—Passing the first fixing suture through the abdominal wall.

into direct contact with the aponeurosis. This weak union rapidly stretches, with the result that the uterus sinks down, leaving a long and dangerous strand of tissue passing from its front surface to the anterior parietes.

That many surgeons have had poor results from ventral fixation we attribute in large measure to the fact of their having used catgut instead of silk for the fixation sutures.

iv. Closing the abdominal cavity.—The rest of the cut edges of the peritoneum, the fascia, and skin are closed in the usual manner (p. 286).

Dressing and after-treatment.—See p. 24 and Chapter xxx.

Dangers.—In ventral fixation the object in view is to procure an adhesion between the anterior surface of the uterus and the parietal

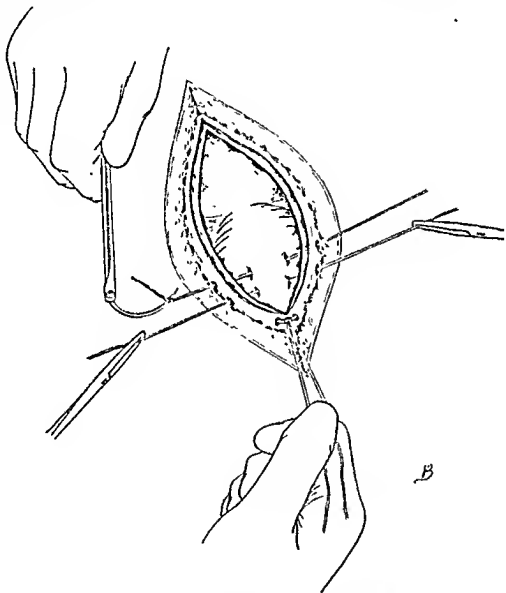


Fig. 435.—Passing the other fixing sutures.

peritonium, which will keep the uterus in anteversion if it was previously displaced, or convert it into an artificial ligament to hold up a prolapsed vaginal vault. The method described fulfils these objects. Ventral fixation should not be entertained when the uterus is very small (e.g. senile), as the organ is then too short to come easily up to the abdominal wall.

We do not practise any of the alternative methods of ventral fixation which have been advocated by certain authorities, such as fundal fixation or posterior fixation, both of which we consider to be dangerous in women of the childbearing age.

It is constantly stated that ventral fixation is often productive of difficulties and danger in pregnancy and labour. We should like to put it on record that no such effects, so far as our knowledge goes, have followed the hundreds of operations for ventral fixation we have per-

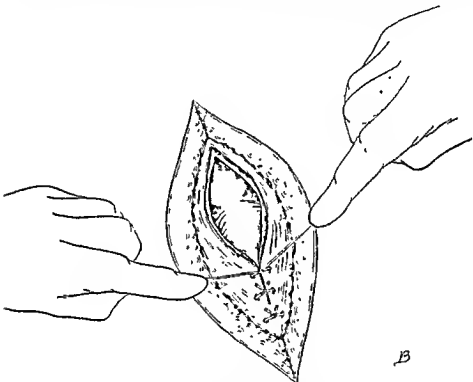


Fig. 436.—Tying the fixing sutures.

formed in the course of our surgical lives. The dire complication of entanglement of the gut with the artificial ligament we have only met once, and that was not a case of our own.*

When the operation is improperly performed, e.g. posterior fixation or extensive and rigid fixation to the fascia, or applied to cases for which it is useless—e.g. prolapse of the vagina below the vaginal vault—such complications are likely, but this is the fault of the technique employed or the ignorance of the surgeon, and not of the operation.

If absolute fixation is desired, then the uterus should be attached directly to the aponeurosis by many stout silk or silkworm-gut sutures,

* Arthur Giles, who followed up for years a large number of his patients on whom he had performed ventral fixation recorded complete absence of subsequent difficulty either in pregnancy or labour.

but this is only justified in exceptional cases of prolapse in which the possibility of a future pregnancy is out of the question.

ROUTINE SHORTENING OF THE ROUND LIGAMENTS

Indications.—This operation is indicated in cases of retroversion giving rise to symptoms, in which the use of a pessary is not indicated or does not give relief. It is an unsuitable operation for prolapse

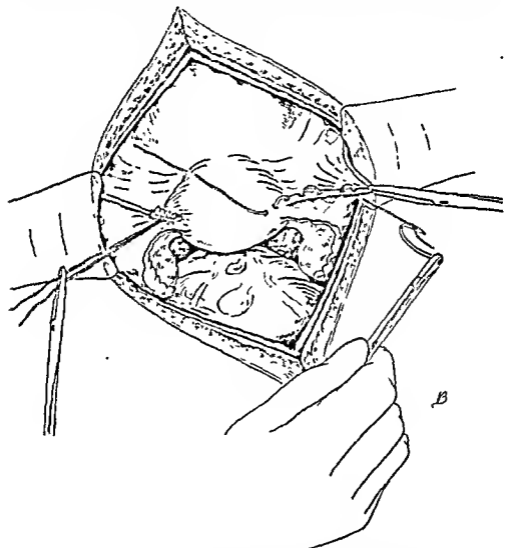


Fig. 437.—Shortening the round ligaments: Passing and tying the pleating suture.

affecting the vaginal vault, because it does not effect a sufficiently direct pull upwards upon the vagina, and its performance actually tends to make a cystocele worse by relaxing the anterior wall of the genital canal.

Preparation of the patient.—See p. 78.

Instruments.—See p. 274. A special pair of forceps (see Fig. 4, p. 8) will also be required.

Operation. i. Opening of the abdominal cavity.—See p. 274. For this operation the transverse skin-incision described at p. 295 is particularly suitable, though for the sake of clearness a vertical incision is illustrated.

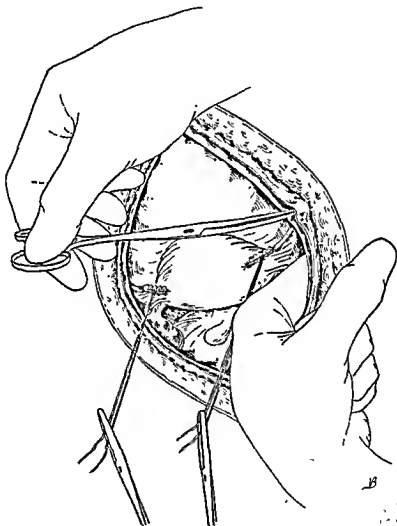


Fig. 438.—Passing the round-ligament fc

ii. Pulling up the uterus.—The uterus is now re and the appendages inspected.

iii. Pleating the round ligaments.—About $\frac{1}{2}$ inc where the round ligament leaves the abdominal suture of No. 4 silk is inserted along the length of the

the

to

point where it joins the uterus (Fig. 437). This ligature, when tied, throws the ligament into a series of folds. The same procedure is then carried out on the opposite side. The ends of the sutures are left long.

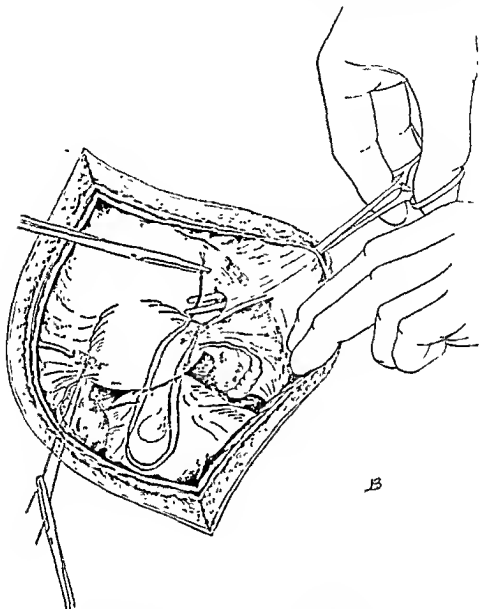


Fig. 439.—Seizing the free ends of the pleating suture.

iv. Passing the round-ligament forceps.—From one edge of the wound the round-ligament forceps is gently inserted between the aponeurosis and the rectus muscle, at a point on the level of the exit of the round ligament from the peritoneal cavity, and is then *insinuated* outwards to beyond the outer margin of the rectus muscle, until a situation near to the

internal abdominal ring is reached, i.e. the point at which the round ligament can be seen to leave the abdominal cavity (Fig. 438). The point of the forceps is now directed inwards and is made to follow a track parallel to the round ligament, immediately in front of it, and under the peritoneum of the broad ligament, until the site of the pleating suture is reached. This part of the operation is much facilitated by

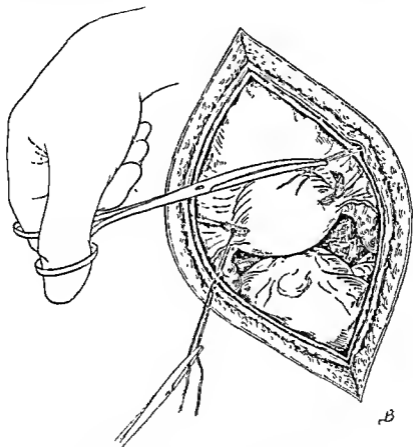


Fig. 440.—Withdrawing the free ends of the pleating suture.

the assistant making traction on the suture ends so that the round ligament becomes taut and apparent. The peritoneum is now perforated by the forceps, aided by nicks of the scalpel on its point, and the ends of the suture which has been applied to the round ligament are seized (Fig. 439). The forceps are then withdrawn, bringing both ends of the suture through the path made by the forceps (Fig. 440). The same procedure is then carried out on the opposite side.

v. Passing the ends of the suture through the aponeurosis.—Reverdin's needle is then passed through the aponeurosis about 1 inch from its cut margin and first one end of the suture and then the other is, in turn,

pulled through it (Fig. 441). When the ends of the sutures are pulled upon, the puckered round ligaments are drawn hard up against the under surface of the abdominal aponeurosis. The ends of the opposite suture are then treated in the same way.

vi. Tying the ends of the suture.—The ends of the sutures are then tied so that the pleated round ligament on either side is anchored to the deep surface of the fascia, outside the rectus muscle (Fig. 442); while one pair of ends is being tied, the assistant should make traction on the other.

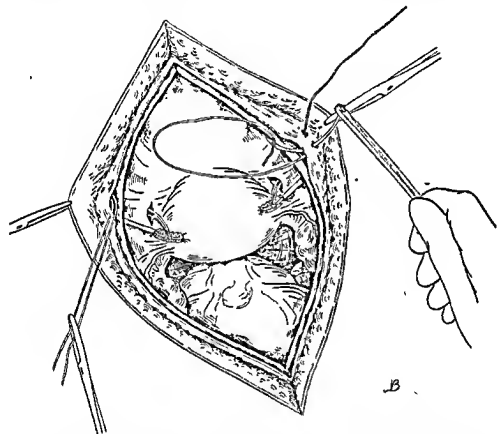


Fig. 441.—Drawing the free ends of the pleating suture through the fascia.

vii. Safety-bolt stitch.—One end of the tied suture on one side is then passed through the aponeurosis a second time and the ends are again tied and then shortened (Fig. 443). The same procedure is carried out on the other side.

viii. Closing the abdominal incision.—See pp. 286 and 298.

Difficulties.—If the uterus is fixed by adhesions to the pouch of Douglas, these will have to be separated before the uterus can be brought forward, and diseased Fallopian tubes or ovaries, or both, will have to be dealt with in the ways described at p. 643.

Dangers.—As the round-ligament forceps are being passed, the uterus is steadied by traction on the suture which has secured the round ligament, and if too much force is employed the round ligament

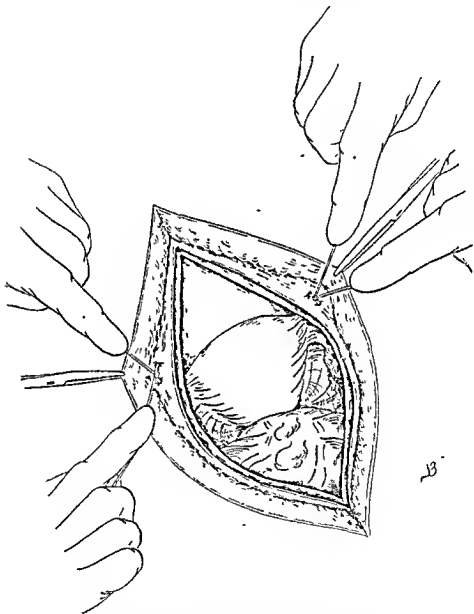


Fig. 442.—Tying the free ends of the pleating suture.

may be torn away from its uterine attachment, in which case the uterus may have to be fixed by ventralfixation.

If the operator is rough there is a risk, when passing the forceps

between the peritoneum and the oblique abdominal muscles, of wounding some of the large vessels about the brim of the pelvis, but if the forceps are passed out fairly near the internal abdominal ring before they make the turn into the broad ligament force is not required.

In the event of such an accident, the peritoneum covering the broad ligament on that side must immediately be divided, the broad ligament opened up, and search made for the bleeding-point. The

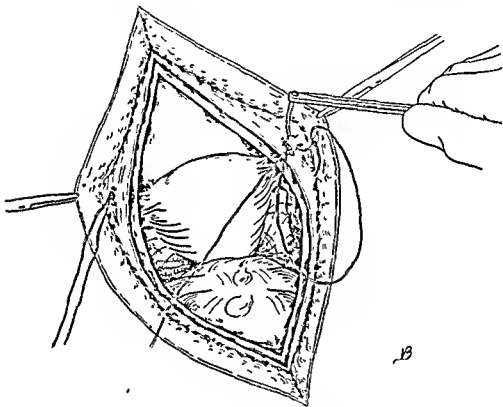


Fig. 443.—The safety-bolt stitch.

deep epigastric vein, just as it comes off the external iliac vein, is the vessel most likely to be injured, but it would be possible to tear the external iliac vein itself.

Great gentleness should therefore be exercised when passing the forceps. If difficulty is met with in making the turn back along the front of the broad ligament, the operator will find it of assistance to pull upon the round ligament by a ring forceps placed upon it, close to the internal ring. This straightens out the folds in the peritoneum which obstruct the points of the forceps; or the fingers of the left hand may pull upon the ligament and guide the point.

Dressing and after-treatment.—See p. 24 and Chapter xxx.

THE SLING OPERATION

Indications.—This operation is an alternative to that just described, to which, however, it is inferior because, though it corrects retroversion, it leaves the uterus low down in the pelvis.

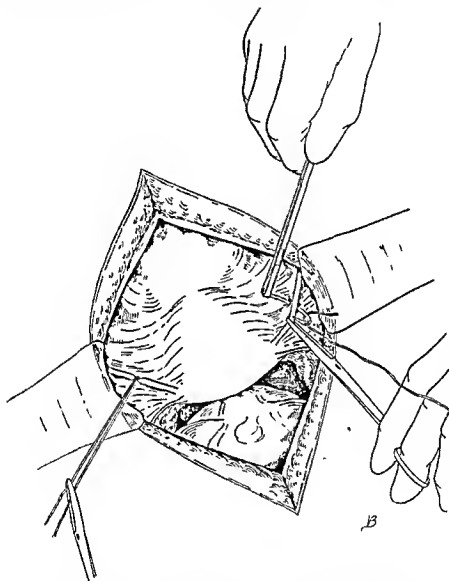


Fig. 444.—The sling operation: Placing the guide ligatures.

In certain cases, nevertheless, it is to be chosen, notably in those in which, owing to thickening of the parametric tissue, the uterus cannot be lifted bodily upwards, and yet it is desirable to correct the backward displacement (*see also pp. 448 and 656*).

Preparation of the patient.—See p. 78.

Instruments.—The same as those described on p. 274.

Operation. i. Opening the abdominal cavity.—See p. 274. Or the transverse suprapubic incision can be used (see p. 295).

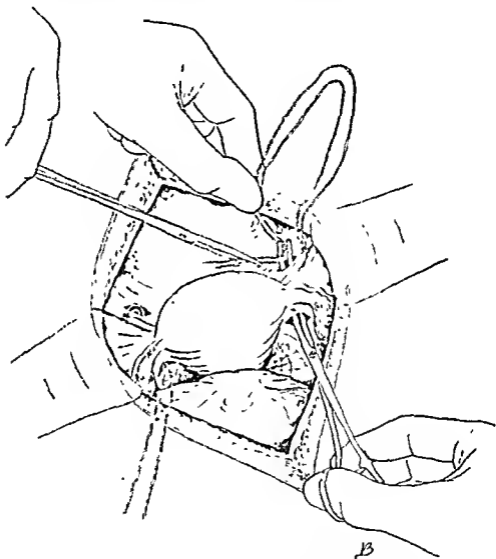


Fig. 445.—Passing the forceps through the broad ligament.

ii. Placing the guide ligatures.—The uterus having been brought into the anteverted position, a No. 4 silk ligature is passed round and tied upon each round ligament about $1\frac{1}{2}$ inches from its junction with the uterus, and the ends are left long (Fig. 444).

iii. Pulling the round ligaments through the broad ligaments.—A round-ligament forceps is now thrust through the broad ligament from

behind forwards through the avascular interval that exists between the ovarian and uterine leash of vessels, and is made to emerge anteriorly just outside and in front of the point where the guide-ligature is attached to the round ligament. The guide-ligature is now seized and the forceps withdrawn, when, by pulling on the former, a loop of round ligament is drawn through the broad ligament (Fig. 445).

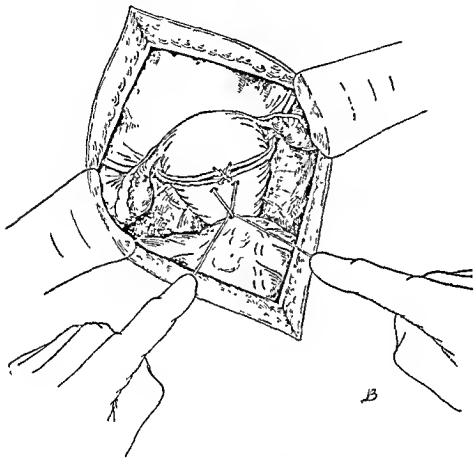


Fig. 446.—Fixing the sling to the back of the uterus.

The same procedure is then carried out on the opposite side.

iv. *Joining the round ligaments at the back of the uterus.*—One free end of each guide-ligature is now tied to its fellow of the opposite side behind the uterus so as to draw the two loops into apposition and to make a sling passing round the back of the organ.

v. *Anchoring the sling to the back of the uterus.*—The sling is now stitched to the back of the uterus by passing the two remaining free ends of the ligatures through the uterine tissue and tying them, thus anchoring the sling to the back of the uterus (Fig. 446). This attach-

ment should be made about the middle of the uterine body, for if it is made lower the uterus may retroflex over the upper edge of the sling.

PLEATING THE ROUND LIGAMENTS

In certain cases it is desirable to antevert the uterus in a simpler manner than those already described; as, for example, in a case of myomectomy in which the reconstituted uterus tends to fall back.

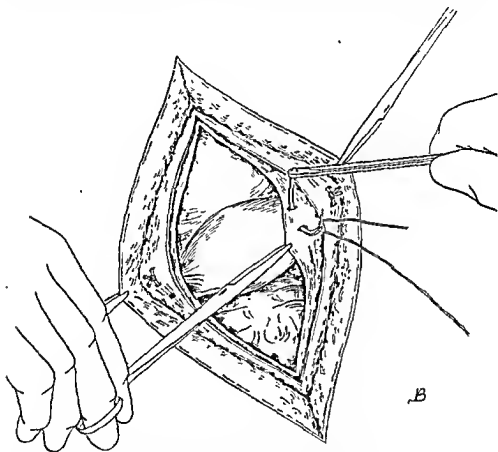


Fig. 447.—Bonney's abdominal shelf operation: Suturing the uterine cornu to the parietal peritoneum.

Such cases are very well treated by simply pleating the round ligaments with a silk suture in the same manner as the first step in the round-ligament operation (*see* p. 594).

BONNEY'S ABDOMINAL SHELF OPERATION

This operation was devised for those patients in whom retroversion of the uterus co-exists with marked enteroptosis. The object of the operation is to form a shelf, or partition, running transversely across the anterior and lower part of the abdominal cavity. The space in

which the intestines lie is thereby diminished because the utero-vesical pouch is cut off from the rest of the peritoneal cavity. The back of the uterus and the broad ligaments form a shelf on which the intestines, and particularly the colon, rest. As a result the intra-abdominal pressure is compelled into its normal direction, i.e. downwards and backwards into the pouch of Douglas instead of forwards on to the bladder.*

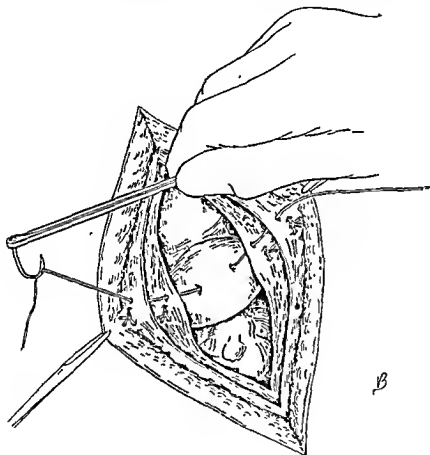


Fig. 448.—Ventralfixing the uterus.

Preparation of patient.—See p. 78. **Instruments.**—See p. 274.

Operation. i. Shortening the round ligaments.—The first step is to shorten the round ligaments by the method already described. See p. 594.

ii. Suturing the parietal peritoneum to the uterine cornua.—A pair of forceps being fixed on to the parietal peritoneum on one side of the wound, the peritoneum is drawn inwards towards the middle line.

* Victor Bonney, "An Operation for Creating an 'Abdominal Shelf,'" *Lancet*, Sept. 4, 1926.

The peritoneum is now sutured to the cornu of the uterus, at a point about $\frac{1}{2}$ inch from its free edge. The same procedure is then carried out on the opposite side (Fig. 447).

iii. *Ventralfixation of the uterus.*—A suture of No. 4 silk is now passed through the fascia and peritoneum of one side of the wound, then through the muscle of the front of the uterus close to the fundus, and then through the peritoneum and fascia of the opposite side of the wound. The suture is then tied, with the result that a continuous attachment from side to side of the broad ligaments and uterus to the abdominal wall is effected (Fig. 448).

iv. *Closing the abdominal wound.*—See p. 286.

Difficulties and dangers.—In some cases it may be necessary to insert two sutures in the region of the cornu, instead of the one described, if the first one leaves a gap. Care should be taken that such a gap does not exist, in case a piece of intestine passes through it, leading subsequently to intestinal obstruction. Many of the patients for whom this operation is suitable are past childbearing, but if there is a chance that the patient might become pregnant, the Fallopian tubes may be ligatured in the manner described on p. 685.

Dressing and after-treatment.—See p. 24 and Chapter xxx.

INVERSION OF THE UTERUS

Chronic inversion is rare. It can generally be cured with the aid of an Aveling repositor. The failures when this instrument is employed are generally due to the fact that the cup of the repositor does not fit the inverted portion of the uterus. All uteri are not of the same size. It is best, therefore, to take a cast of the inverted portion by scooping out a piece of yellow soap, and then have a boxwood cup turned of the same size and shape.

In rare cases Aveling's repositor, in spite of every care, fails, and an operation has to be performed for the cure of the inversion.

Many operations have been proposed, both by the abdominal and by the vaginal route, including hysterectomy.

The operation described by the elder Haultain, in which, through an abdominal incision, the posterior wall of the uterus is incised, is very satisfactory. The abdominal route has three advantages over the vaginal, because (1) the incision of the uterus is reduced to a minimum; (2) traction on the round and broad ligaments helps reposition; (3) the uterine wall can be more accurately sutured and hæmorrhage more efficiently controlled.

Preparation of the patient.—See p. 78. The vagina and inverted uterus should be freely swabbed with Violet-green on the operating table and the catheter passed.

Instruments.—See p. 274.

Operation. i. Opening the abdominal cavity.—See p. 274. On opening the abdominal wall the cup-shaped depression is seen in the uterus.

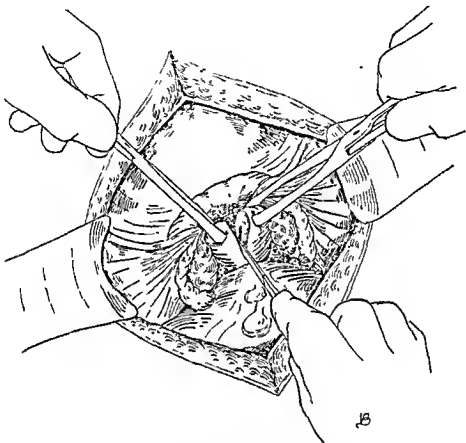


Fig. 449.—Haultain's operation for uterine inversion: Incising the posterior uterine wall.

ii. Incising the posterior wall of the uterus.—The uterus is pulled up with a volsellum, and the posterior rim of the cup incised through both thicknesses of the inverted wall (Fig. 449).

iii. Reposition.—The inverted fundus is pulled up from above, aided by a finger passed through the incision into the vagina.

iv. Suturing the uterine incision.—The incision into the uterus is carefully sutured with interrupted No. 1 catgut sutures and all hæmorrhage arrested.

v. Closing the abdominal cavity.—See p. 286.

Dressing and after-treatment.—See p. 24 and Chapter xxx.

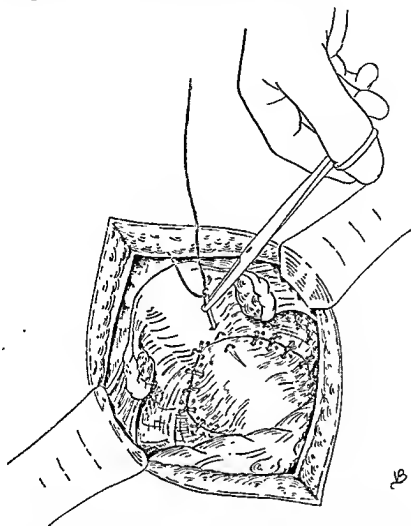


Fig. 450.—Bonney's operation for rectal prolapse: Obliterating the pouch of Douglas.

BONNEY'S OPERATION FOR PROLAPSE OF THE RECTUM IN WOMEN

The following operation was devised by one of us for the cure of true prolapse of the rectum in women: that is to say, that form of prolapse in which the downward movement of the bowel begins in the upper rectum or at the recto-colic junction, and not that form which is a mere rolling out of the rectal mucosa through a relaxed and (generally) hæmorrhoidal anus. It has been exceedingly successful in our hands.

The same operation, but without, as a routine, ventralfixing the uterus, was introduced in America by Moschowitz.*

* A. V. Moschowitz, *Surg. Gyn and Obst* Vol. xv. p. 7, 1912.

Preparation of the patient.—See p. 274.

Instruments.—Those listed on p. 274.

As the depth at which the suturing has to take place is often great and the space restricted, notched needles of the type used to repair cleft palate are very useful.

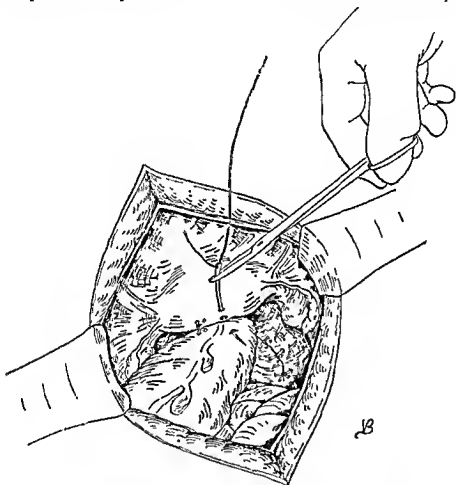


Fig. 451.—Suturing the lower part of the pelvic colon to the back of the uterus.

Operation. i. Opening the abdomen.—A middle line sub-umbilical incision is required.

ii. Obliterating Douglas's pouch.—By means of a series of tiers of interrupted No. 2 silk sutures, the posterior and anterior surfaces of Douglas's pouch are brought together, the sutures being inserted posteriorly through the peritoneum covering the anterior face of the rectum and utero-sacral folds, and anteriorly through the peritoneum covering the upper end of the vagina and the cervix in the middle line and the back surface of the broad ligaments on each side. Only the peritoneum is

picked up by the needle, and each suture after insertion is immediately tied (Fig. 450). The bowel should be pulled up while the suture is in

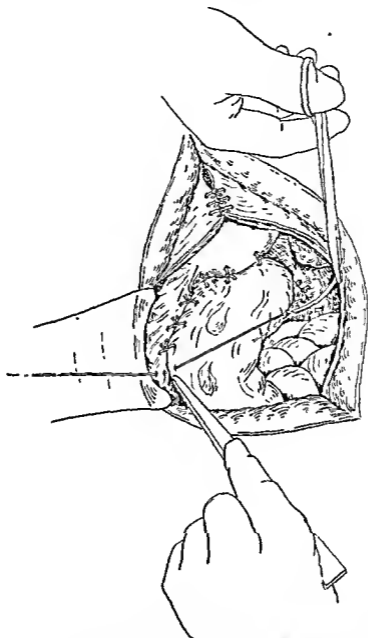


Fig. 452.—Suturing the upper part of the pelvic colon to the top of the left broad ligament after the uterus has been ventralfixed.

progress and the process continued until all trace of the pouch has disappeared.

iii. Attaching the colon to the back of the uterus.—The colon above the rectum is now attached to the back of the uterus by tiers of No. 2 silk sutures almost as high as the fundus (Fig. 451).

iv. Tying the Fallopian tubes.—Since pregnancy would be very dangerous with the colon attached to the back of the uterus, the Fallopian tubes are tied in the manner described on p. 685 or, as an alternative, the modified operation described below can be performed.

v. Ventralfixing the uterus.—The uterus is now ventralfixed as described on p. 588.

vi. Suturing the colon to the top of the left broad ligament.—This is an important step in the operation for, if it is omitted, the bowel is left sharply kinked where it is attached to the top of the uterus. To prevent such kinking the colon is attached by a series of interrupted No. 2 silk sutures to the top of the left broad ligament as far as the lateral pelvic wall and iliac fossa (Fig. 452).

vii. Closing the abdominal wound.—See p. 286.

After-treatment.—See p. 24, and Chapter xxx. Liquid paraffin should be given for 4 or 5 days before the bowels are opened with a glycerin enema. An aperient had better be postponed until the end of the week.

Difficulties.—The operation is an easy one, though it takes some time to perform. With the most ordinary care there should be no risk of penetrating the bowel, for it is only the peritoneum that should be picked up by the needle. If the pelvic floor is weak this should be repaired by colpoperineorrhaphy. See p. 514.

Variation in technique.—Prolapse of the rectum is very rare in a young woman but it does sometimes occur, and in that event the operation should be modified by only fixing the bowel as high as the junction of the body of the uterus and the cervix, from whence it should be attached, sloping obliquely upwards, to the back of the left broad ligament and the brim of the pelvis. The round ligaments are now shortened in the manner described on p. 594. The tubes are not tied, since the body of the uterus is left free to expand in the event of pregnancy.

A patient on whom this variation of the operation had been performed 4 years before was successfully delivered by Cæsarean section. Natural labour could have been allowed, but abdominal delivery was decided on for fear that during the course of labour the excellent result of the previous operation might be impaired.

CHAPTER XXIII

OPERATIONS ON THE OVARIES AND BROAD-LIGAMENT CYSTS

GENERAL CONSIDERATIONS

THE ovary in full activity performs no less than seven functions, namely:—(1) it plays a large part in the development of the female physical and psychological characteristics; (2) it governs menstruation; (3) it produces fertilizable ova; (4) it exercises a strong influence on the sex-sense; (5) it promotes the nidation of the ovum; (6) it is largely responsible for the changes the breast undergoes in pregnancy; and (7) it is a factor in the control of the vaso-motor system. This is an imposing list which of itself demonstrates the need for ovarian conservation whenever this can be effected safely.

It has been pointed out by one of us,* that these seven functions are often not present in their entirety, either in the individual ovary, or in the sum of the two ovaries together, certain of them being missing throughout the whole of the woman's life; and further that they are sometimes divided up between the two ovaries, or only exist in one of them, the other being inert. It is important for the surgeon to realize this, because the common apology for removing an ovary on slight provocation is that the patient has another one to go on with, an excuse which presupposes that the remaining ovary is fully functioning. But often this is not the case, and at times the removal of one only takes away all the active ovarian tissue that the patient possesses.

Surgeons are much more conservative than they were in the past, but there is yet room for improvement, for the removal of a single ovary for some trivial abnormality is still quite commonly carried out, that on the right side being the usual victim because it is accessible through an appendicectomy incision, "A cyst on it" is the usual reason given. We have emphasized the importance of conserving the ovaries when performing hysterectomy, except for malignant disease (*see* p. 540) and we refer again to the subject in the sections dealing with the surgery of the Fallopian tubes (*see* p. 643).

Though in ovarian surgery conservatism should be in the forefront of the operator's mind, it is impossible to observe it when dealing with cysts or tumours which are actually or suspectedly malignant; while in patients well past the climacteric, whose ovaries have ceased to function, the saving or removing of them becomes merely a matter of technical propriety.

* Victor Bonney: "The Fruits of Conservatism"; *Brit. Journ. Obst. and Gyn.* 1937. Vol. xlv. p. 1; "Merciful and Unmerciful Surgery"; *Medical Press and Circ.* June 4th, 1941.

We will begin by describing the operations of conservative ovarian surgery.

OVARIAN CYSTECTOMY

We have given this name to the operation whereby a cyst or tumour is enucleated from the ovary, leaving behind the whole ovarian substance, in contradistinction to ovarian resection, in which part only of the ovarian substance is left behind, and to ovariotomy, when the whole of it is removed.

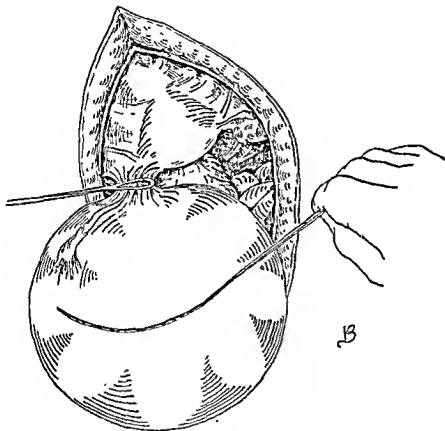


Fig. 453.—Ovarian cystectomy: Incising the capsule of the cyst.

The fact that fibroids are enucleable tumours has been known for a great number of years, but the parallel fact that the large majority of innocent ovarian cysts and tumours are likewise enucleable is quite recent knowledge. Who first discovered it is not clear. Fitzgibbon reported two cases of the operation in 1923 and we learn that it had been practised at the Rotunda Hospital for some years before that. One of us (V.B.) independently discovered the fact in 1916 and, pursuing its implications, was able to publish his experience of a number of cases in 1924, and since then has written much on the subject.*

*See particularly: "The Technical Minutes of Extended Myomectomy and Ovarian Cystectomy," Victor Bonney. Cassell & Co. 1916.

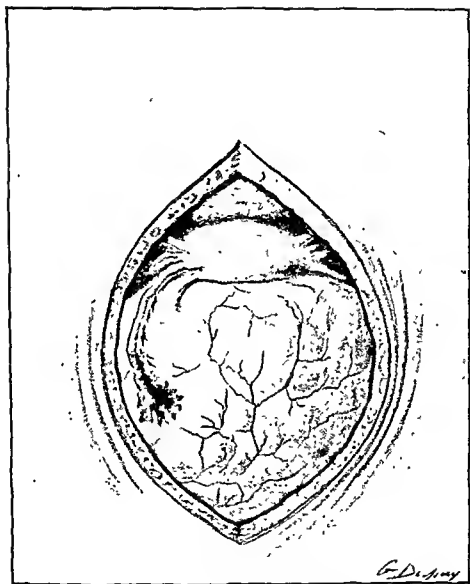
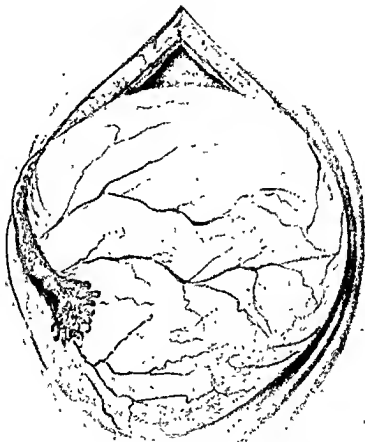


PLATE VIII.—Multilocular Ovarian Adeno-cystoma of the Left Side



G. Dupuy.

PLATE IX.—Ovarian Dermoid Cyst.

The knowledge he has brought to light may be thus summarized: all innocent cysts—including in that category follicular cysts, simple unilocular cysts, multilocular cyst-adenomata, blood cysts, "chocolate" cysts, lutein cysts and dermoid cysts, as well as many innocent solid tumours such as fibromata, and granulosa tumours—grow within the substance of the ovary and expand its substance over them in the

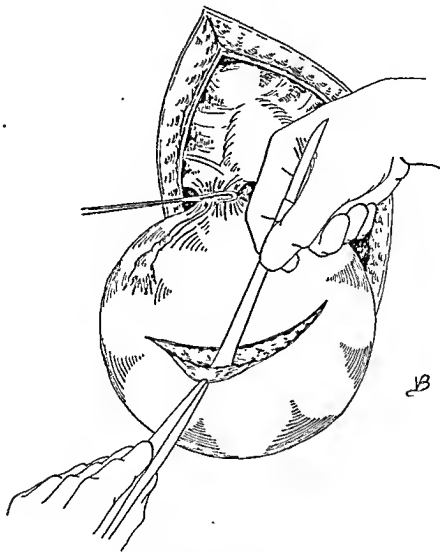


Fig. 454.—Reflecting the capsule.

same way that fibroids growing within the uterine wall expand it over them. A plane of cleavage exists between the cyst wall proper, or the surface of the solid tumour, and the stretched ovarian tissue that encapsules it and, by following this plane, the cyst or tumour can be enucleated leaving the entire ovarian substance behind. The only exceptions to this rule are some of the very large cysts in which the plane may be

obliterated, and cysts which have been inflamed when the plane becomes sealed up.

We thought at first that enucleation could only be applied to small cysts, but have discovered that large cysts, up to 20 pounds in weight, can be equally well dealt with. An interesting fact emerges from this, namely, that the ovarian substance that encapsules large cysts or tumours becomes hypertrophied, like the uterine wall which covers large fibroids.

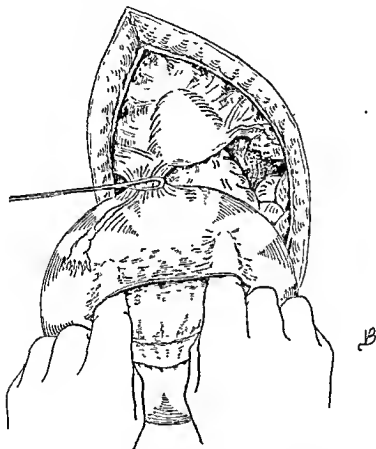


Fig. 455.—Continuing the reflection of the capsule by the fingers.

The operation is indicated as a preferable alternative to ovariectomy (oöphorectomy) in all cases of innocent ovarian cysts in women who have not reached the climacteric, especially when the cysts are bilateral.

Preparing the patient.—See p. 78.

Instruments.—See p. 274.

Operation. i. **Opening the abdominal cavity.**—See p. 274. The size of the opening will depend on the size of the tumour to be dealt with. It must be large enough to bring it outside the abdomen.

ii. **Extracting the ovary.**—The enlarged ovary is now lifted outside the wound.

iii. **Clamping the ovarian vessels.**—A pair of ring forceps is placed across the pedicle to render the operation bloodless.

iv. **Incising the ovarian capsule.**—A very superficial incision is

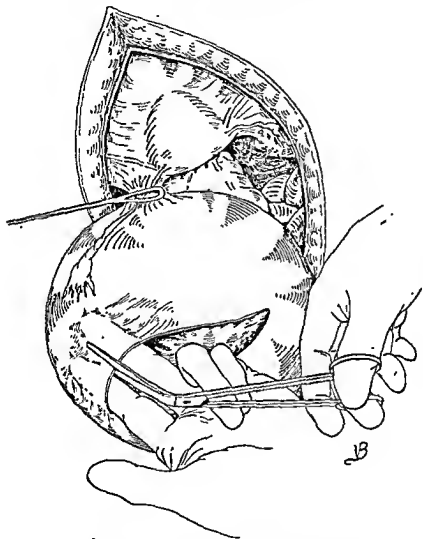


Fig. 456.—Enlarging the incision in the capsule.

lightly made through the ovarian substance, taking care not to open the cyst underneath. Its length will depend on the size of the cyst, but 1 to 3 inches will be sufficient to begin with. If one part of the capsule appears thickest the incision should be made there (Fig. 453).

v. **Finding the plane of cleavage.**—With forceps and the handle of the scalpel (Fig. 454) the plane of cleavage is sought, and when found is followed up first by one index finger and then by both (Fig. 455).

vi. **Completing the enucleation.**—As more and more of the capsule is separated, the incision in it is extended until it reaches halfway round the cyst (Fig. 456). When the capsule is sufficiently reflected, separation

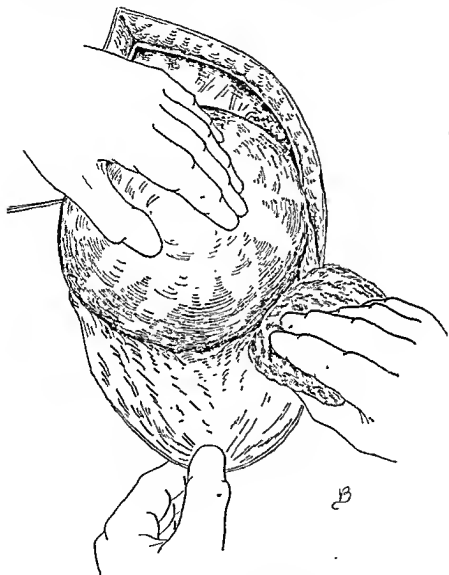


Fig. 457.—Completing the enucleation of the cyst.

may be aided by gently pulling on it and stroking it off with a swab (Fig. 457).

vii. **Treatment of the capsule.**—The cyst being removed, what is left is the whole ovary in the guise of the thin capsule, and this must be made into a solid mass. If it is not too large, the best way to do this is as follows:—A continuous mattress or puckering suture of catgut is

inserted backwards and forwards through both layers of the capsule as shown in Fig. 463. This suture, when pulled upon and tied, brings the inner surfaces of the capsule together and buckles it up. A second may be applied if necessary. Finally, a continuous suture is used to bring the edges together. When the capsule is very large it must be folded up, and the folds fixed by sutures as shown in Fig. 458, after which the continuous mattress-suture is inserted and the whole completed by a

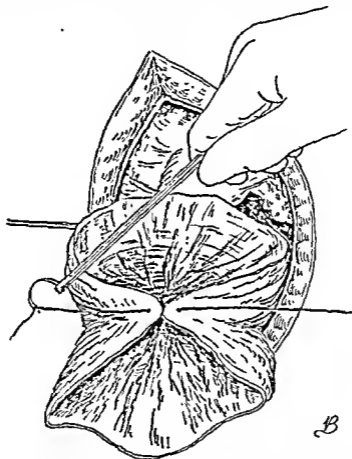
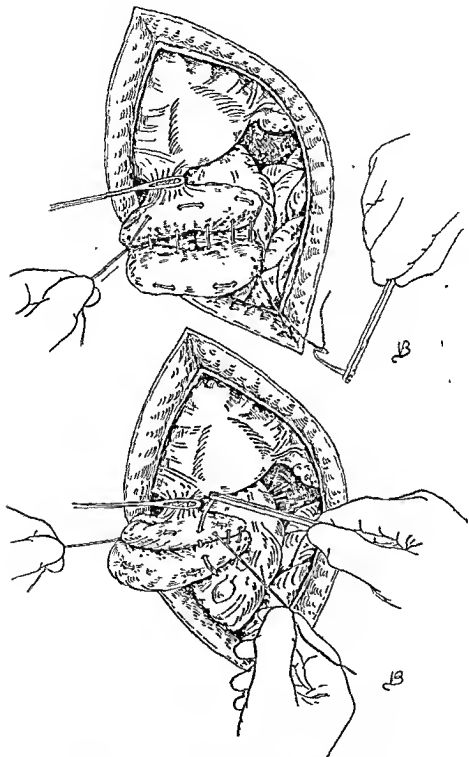


Fig. 458.—Beginning the reconstruction of the capsule.

running stitch (Figs. 459 and 460). The exact technique varies with the amount of ovarian tissue to be reconstructed, and the surgeon must exercise his own ingenuity.

viii. *Final steps.*—The ring forceps on the pedicle is now removed and, if there is any bleeding, it is stopped by additional sutures, after which the reconstructed ovary is replaced and the abdominal wound closed. See p. 286.

Difficulties.—A surgeon doing this operation for the first time may have qualms that the anæmic sutured mass that he replaces will undergo necrosis, but it does nothing of the kind, even when considerably larger



Figs. 459 and 460.—Continuing and completing the reconstruction of the ovary.

than the normal organ. It seems probable that the stretched ovarian tissue has for so long had its blood supply cut off, by the pressure of the cyst within it, that it has developed some other way of obtaining nutrition, comparable with the nutrition of the cornea of the eye.

The operation is a very easy one. If unfortunately the cyst is opened while enucleating it, the contents should be evacuated and the

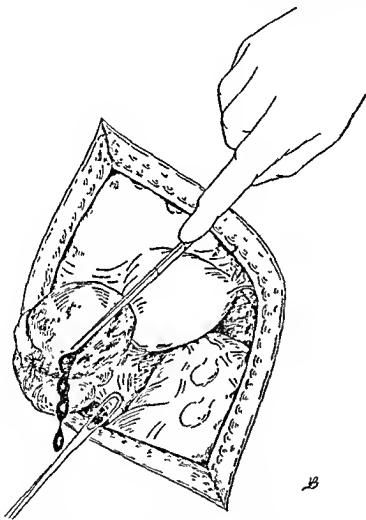


Fig. 461.—Evisceration of an endometriomatous ovarian cyst: Opening the cyst.

cyst wall eviscerated as described below. If a plane of cleavage cannot be found, the cyst may be opened, evacuated and part of the capsule cut away; the rest of the cyst wall is sought on the remainder of it and when found stripped off it; or ovariectomy may be performed by the usual technique.

The operation should not be carried out if there is the slightest suspicion of malignancy nor for cysts obviously inflamed. Badly twisted cysts are likewise unsuitable but for those where the twist is

recent and the cyst, though discoloured, is not necrotic Stanley Way has shown that if the surgeon, having undone the twist, waits a while, he will see the circulation restore itself; in which event ovarian cystectomy, if desirable in the patient's interests, can be proceeded with.

After-results.—See Chapter XXIX, p. 939.

EVISCERATION OF AN OVARIAN CYST

Small cysts, not larger than a walnut, especially when there are

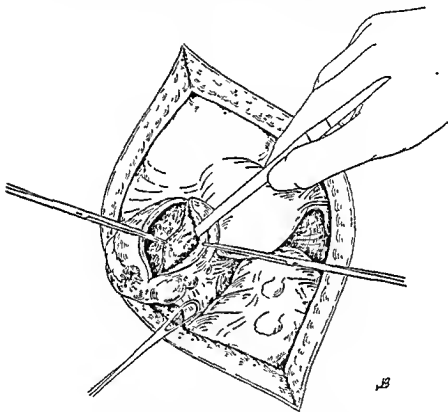


Fig. 462.—Stripping out the cyst-wall.

several in one ovary, are best dealt with by opening them, tearing out the cyst wall and then closing the cavity by sutures. Blood cysts, whether of endometriomatous origin or otherwise, and follicular cysts are, generally speaking, to be treated in this way. Evisceration is also the proper course when, in seeking to enucleate a cyst, the cavity of it is inadvertently opened, and also in some cases in which a plane of cleavage cannot be found, as mentioned above.

Operation.—The ovary having been brought up, the cyst is incised, the contents removed (Fig. 461) and the edge of the cyst wall, being defined, is seized with forceps and, aided by the finger or the handle of the scalpel, stripped away (Fig. 462). Other cysts, if there are any,

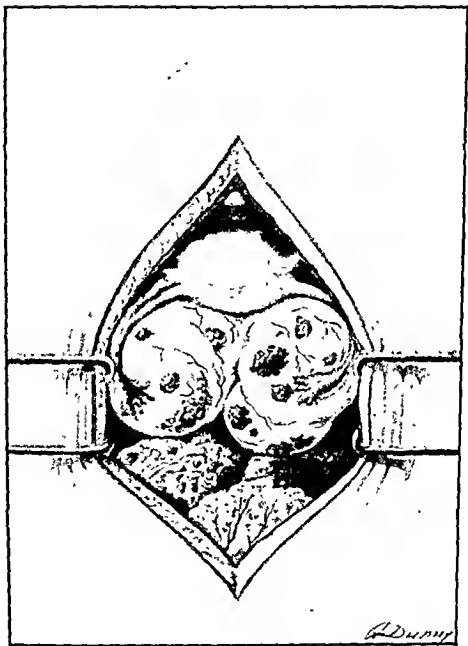


PLATE X — Bilateral Papilliferous Ovarian Cysts

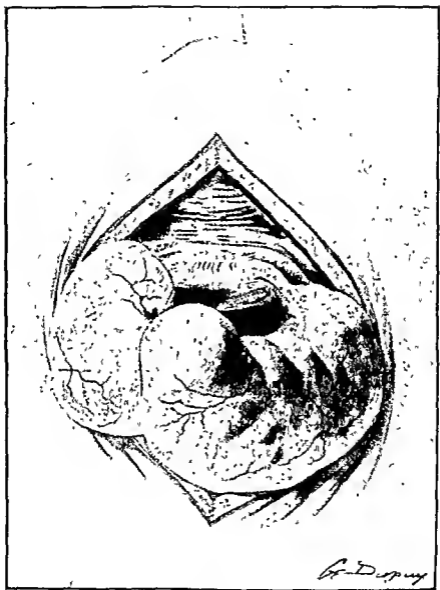


PLATE XI.—Bilateral Malignant Ovarian Tumour.

are then treated in the same way and the cavity or cavities left are, if small, closed by simple interrupted sutures or, if large, by one of the two methods described under ovarian cystectomy. Figs. 458, 459, 460 and 463.

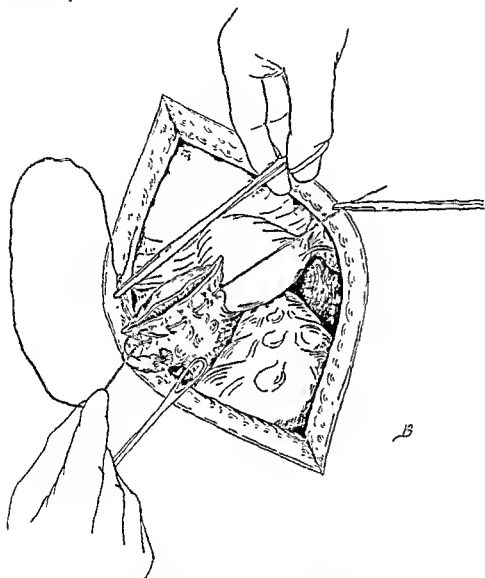


Fig. 463.—Suture of the expanded ovary.

RESECTION OF AN OVARIAN CYST

Certain small superficial cysts of the ovary can be well removed by resecting them from the ovary, together with that portion of the ovarian tissue which surrounds them.

Operation.—The ovary having been pulled up, a wedge-shaped portion is excised with the scalpel and removed together with the

cyst (Fig. 464). The cut surfaces of the ovary are approximated by catgut sutures:

A simple method of dealing with small, very superficially placed, thin-walled cysts is to open them, evacuate their contents, pull up the collapsed tissue which results, and tie a ligature round it at its junction with the solid ovarian tissue. It is better not to cut away the tissue distal to the ligature for fear of the ligature slipping. The tissue thus ligated undergoes necrobiosis. This method is very useful

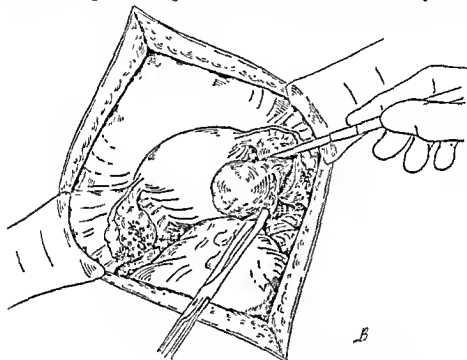


Fig. 464.—Resection of an ovarian cyst: Wedge-shaped excision on the right side and method of suture on the left.

when troublesome bleeding is occurring from a thin-walled cyst accidentally ruptured during operative manipulation, especially in those cases in which it is highly undesirable to remove the ovary.

OVARIOTOMY

Indications.—Ovariectomy signifies the removal of an ovary containing an ovarian tumour. The more correct term oöphorectomy is by custom restricted to the removal of the unenlarged or but slightly enlarged ovary. The presence of an ovarian tumour in a patient is, with few exceptions, an indication for its removal at the earliest opportunity, and is contra-indicated only in cases in which the general condition of the patient is so bad that an operation would in all likelihood cause her death. In such circumstances, if it is the size of a cyst that is increasing her distress, it

ould be tapped and the operation postponed till the patient is fit to bear it. Also, a small cyst, well out of the pelvis, discovered at the end of pregnancy may be allowed to remain till the puerperium is well established.

Ovariectomy varies very much in difficulty. In many cases it is one of the easiest major operations in surgery; in others its removal may tax the ingenuity of the most experienced gynaecological surgeon, and may be altogether impossible. The operation is inferior to ovarian cystectomy (already described) in that it removes the whole ovary, but this is necessary when the tumour is actually or suspectedly malignant, while with elderly patients, when the propriety of conserving the ovarian tissue does not arise, it is the simplest way of getting rid of the tumour.

Preparation of the patient.—See p. 78.

Instruments.—See p. 274. If the surgeon is accustomed to tap the cyst before removal, an ovarian trocar may be added to the list given.

Operation. i. Opening the abdominal cavity.—See p. 274. The size of the opening will vary according to whether the tumour is cystic or solid, and whether the operator intends, if the tumour is cystic, to tap its contents before delivering it. In all cases the incision should be large enough to insert the hand, so that a complete exploration of the surface of the tumour can be effected (Fig. 465). The practice of blindly tapping a presenting cyst through a smaller incision than this is a most unsurgical procedure which is fraught with danger.

ii. Tapping ovarian cysts.—The custom of tapping ovarian cysts before delivering them through the abdominal incision is still practised by some operators, their argument being that, as a rule, a smaller abdominal incision will suffice and there is less exposure of the intestines.

On the other hand, the following points may be urged against this practice:

(a) In many cases it is impossible to diagnose the contents of an ovarian cyst until the wall is punctured. The cyst may be a dermoid and the fluid too thick to flow through the trocar, or the cyst may be malignant, in which case some of the papillomatous growths escaping may become attached to the viscera, or parietes, and form secondary nodules. Or, again, the cyst may be granular and its colloid secretion too thick to flow through the tube, or multilocular, so that the evacuation of all the cavities is impossible. Lastly, the cyst may be inflamed and contain pus.

(b) Having once plunged a trocar into a cyst, it is difficult to prevent the fluid from oozing up by the side of it, and if the fluid is too thick to flow through the trocar the cyst has to be incised and the contents allowed to escape, or scooped out by the hand, as may be; or the attempt to reduce the size before removal has to be abandoned, after the patient has been exposed to all the risk due to escape of the cyst-contents.

The escape of fluid into the peritoneal cavity can be saved by the employment of a water suction apparatus similar to that used by dentists to keep the mouth clear of saliva.

(c) A further reason for not tapping an ovarian cyst is that if adhesions are present they will be much more difficult to separate from a collapsed cyst-wall than from one tightly stretched.

(d) The most important argument against routine tapping is the

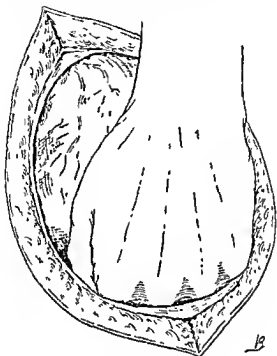


Fig. 465.—Ovariectomy : Exploring the surface of the cyst.

fact, now clearly established, that a much larger number of these tumours are malignant than was formerly believed.

Large thin-walled unilocular cysts in young women, if there is no reasonable doubt that they are innocent, may be tapped, so that a long and unsightly scar may be avoided. In all other cases it has been our practice to remove the cyst whole.

If the operator wishes to tap the cyst, he can do so with one of the many ovarian trocars, or, if a trocar is not available, the cyst-wall can be incised with a scalpel and a long piece of india-rubber tubing inserted through the hole. As the cyst empties, the collapsed wall should be grasped by a pair of ring forceps, and thus gradually drawn up through the opening. The assistant meanwhile prevents, so far as

possible, any contents from escaping into the peritoneal cavity by approximating the edges of the punctured or incised cyst, and further assists the escape of the fluid and the delivery of the cyst by pressing on the sides of the abdomen (Fig. 466).

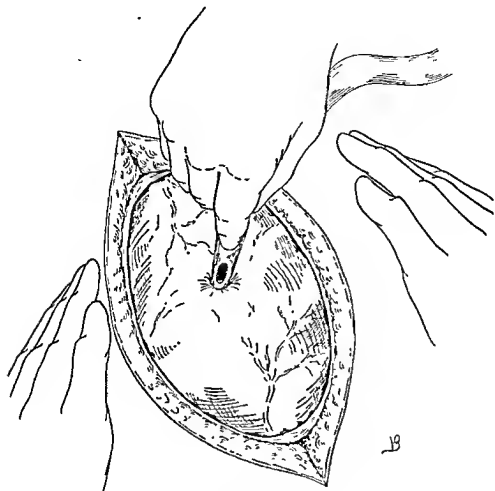


FIG. 466.—Tapping the cyst.

Precautions.—Before tapping the tumour one must be satisfied that it is an ovarian cyst and not a cystic fibroid or a pregnant uterus distended by hydramnios. These mistakes have unfortunately been made on occasion. If, from the appearance of the cyst-wall, the operator has reason to suspect that he has to deal with a dermoid, a suppurating or a malignant cyst, the tumour should not be tapped. The wall of a benign ovarian cyst resembles mother-of-pearl in appearance; if, therefore, the tumour is dull, discoloured, bossy, or has papillomatous growths attached to it, it must be delivered whole.

Lastly, before tapping a cyst, the operator should make sure, by passing the fingers over its upper surface, that there are no adhesions in this situation; if there are, and he taps the cyst before separating them, he will not be able to draw it up out of the wound.

When tapping, the operator should push the trocar gently through the cyst-wall, while his assistant supports the tumour on each side. If it is necessary to puncture secondary cysts, care must be taken not to force the point of the instrument through the main cyst-wall.

Supposing it has been decided, for the time being at any rate, not to tap the cyst, and always in the case of a solid ovarian tumour, the abdominal incision is extended to a length requisite for the removal of the tumour whole.

iii. *Freeing adhesions.*—The operator then inserts his right and left hands respectively over the surface of the tumour, to ascertain if there are any adhesions between the tumour and parietes and/or any of the abdominal contents, and if so, he separates them with his fingers, if he can. The right hand is the more useful for passing over the upper surface of the tumour and the under surface at its upper part, and the left hand for the under surface of its lower part.

iv. *Delivery of the tumour.*—The adhesions, if any, having been freed, the tumour is gently lifted up in the hollow of the hand, palmar surface uppermost, through the abdominal wound (Fig. 467), which is retracted. On its delivery the tumour is handed to the assistant, who will take special care not to drag on the pedicle, since in some cases this may be so thin, or so rotten, that the slightest strain will rupture it, with the result that the distal end will slip down into the pelvis and brisk hæmorrhage result before it can be secured.

v. *Examination of the opposite ovary.*—Before removing the tumour, the ovary on the opposite side should be examined, for on its condition will depend very largely the sort of operation for the removal of the cyst. Thus, if the opposite ovary is also cystic and the patient relatively young, ovarian cystectomy is most certainly the proper operation unless there is a suspicion of malignancy. See pp. 612 to 622.

In the case of papillomatous or frankly malignant ovarian cysts, many authorities recommend the removal of the opposite ovary, even if it appear healthy.

vi. *Clamping the pedicle and removal of the tumour.*—The pedicle of an ovarian tumour consists of the ovarian artery, the pampiniform plexus of veins, the ovario-pelvic and ovario-uterine ligaments, with the portion of the broad ligament between these structures, and frequently the Fallopian tube. The pedicle is clamped with two pairs of pressure forceps, and the tumour is removed by cutting through the pedicle at least half an inch above the forceps, since, if the point of

severance be too near the forceps, the pedicle may retract and the ligatures slip after they have been applied (Fig. 468).

vii. **Transfixion and ligature of the pedicle.**—The pedicle is now transfixed below and between the ends of the forceps with a double silk ligature (Fig. 469), care being taken to avoid the plexus of veins. The loop of this ligature is then cut so that two separate ligatures remain. The pedicle can then be firmly secured in two halves by these ligatures,



Fig. 467.—Delivering the cyst whole.

care being exercised to take hold of the corresponding ends of the ligatures when tying them (Fig. 470). The stump being loosely held with pressure forceps by an assistant, a third, encircling, ligature is lastly applied round the whole pedicle in the sulcus made by the other ligatures, thus securing any veins which may have escaped the primary ligatures (Fig. 471).

The stump is then swabbed and, if it remains blanched, the ligatures are cut short and it is allowed to fall back into the abdomen, preparatory to being buried.

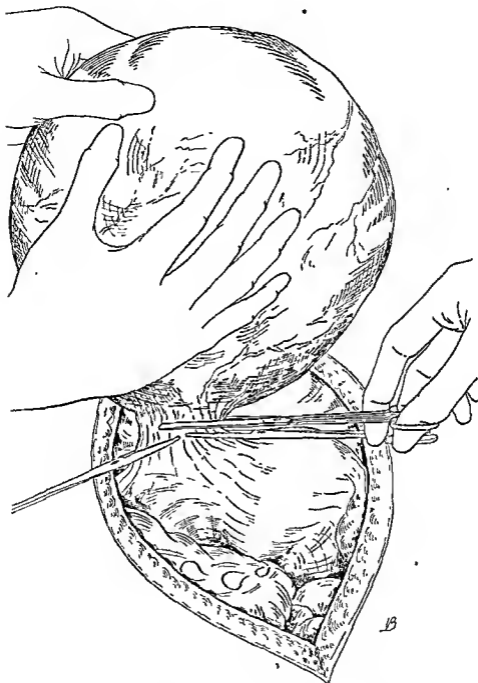


Fig. 468.—Clamping and dividing the pedicle.

Variations in treatment of the pedicle.—The method of ligaturing the stump given above is simple, and, when properly carried out, quite satisfactory for thin pedicles, but some of the other methods described elsewhere (pp. 42-49) are equally effective. The pedicle at times is so

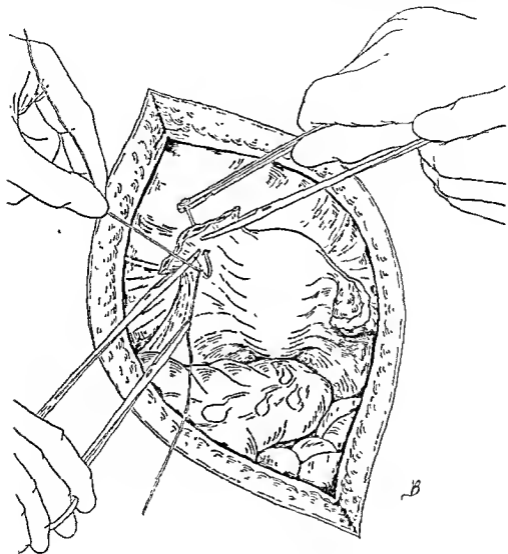


Fig. 469.—Transfixing the pedicle.

broad that there would be great danger of its retracting if it were only ligatured in halves, and in these circumstances a chain of three, four, or more ligatures may be applied, according to the directions given at p. 47.

viii. Burying the pedicle.—It is best, but not always possible, to bury the pedicle under the peritoneum so as to minimize the likelihood

of adhesion to bowel or omentum. There are several ways of doing this (see p. 48).

ix. Closing the abdominal incision.—See p. 286.

Dressing and after-treatment.—See p. 24 and Chapter xxx.

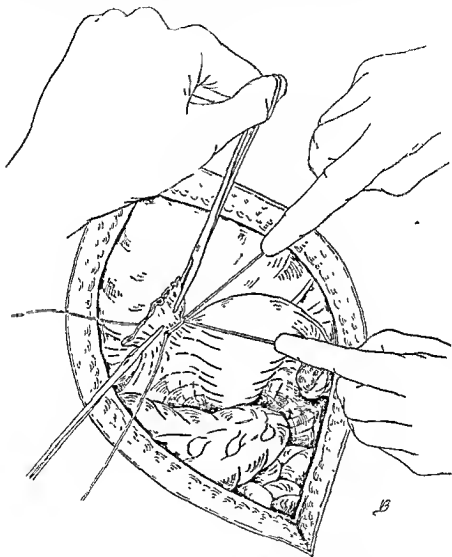


Fig. 470.—Tying the pedicle in halves.

Difficulties and dangers. i. Delivering the tumour.—Ovarian cysts are very liable to inflammation, owing to torsion of the pedicle, pressure, the nature of their contents, contiguous sepsis, or other causes. As a consequence the cyst may become adherent to intestines, omentum, bladder, rectum, to the large blood-vessels, to the floor of the pelvis, to the abdominal parietes, or to the diaphragm. If adhesions

are present and they cannot be easily separated with the fingers, it will be dangerous and perhaps impossible to deliver the tumour before they are separated, and for this reason care must be taken that any dense adhesions on the under-surface are detected, otherwise they

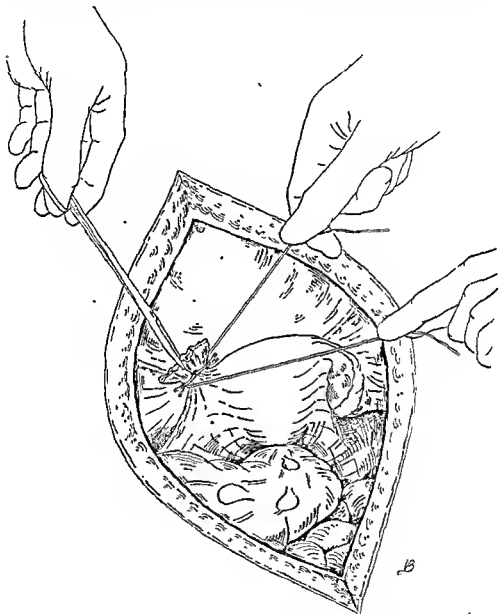


Fig. 471.—Applying the encircling ligature.

may be torn through and, if they are attached to veins, great hæmorrhage may immediately occur. Adhesions can be separated by hand, swabs, scissors, or scalpel. Parietal adhesions or adhesions to the floor of the pelvis are, as a rule, best separated by gently insinuating the hand between the cyst-wall and the *peritoneum*. If the tumour is adherent

to the parietal peritoneum, the operator must be careful to identify the wall of the cyst. Failure to do so will result in the peritoneum being mistaken for the cyst-wall, when, adhering to the cyst-wall, it will be stripped off the overlying muscle, and we have known this to extend over a large area of the parietes before the mistake was discovered.

In tying off omental adhesions the operator must avoid including a portion of the transverse colon.

When the intestine is adherent to the cyst and has to be dissected off, the wall of the intestine must be clearly identified, since the two are sometimes so intimately attached and the intestine so spread that it is quite easy to mistake the tissues and open the bowel.

Part of the cyst may also be impacted in Douglas's pouch, in which case care must be taken not to rupture this portion during its delivery.

ii. Restraint of the intestines.—In some cases in which the tumour is very large and the incision in the abdominal parietes extensive, the biggest swab will not be sufficient to keep the bowels in position after the tumour is delivered. This drawback can be surmounted by drawing together that part of the incision above the umbilicus with one or two temporary silk sutures passing through all the layers of the abdominal wall.

Irremovable ovarian cysts.—It sometimes happens that, whereas the removal of an adherent ovarian tumour at first seems feasible, the surgeon after a while finds that the successful termination of the operation is impossible. In these circumstances three courses are open to him: (a) He may empty the cyst of its contents and then stitch the edges of the incision in the cyst-wall to the abdominal opening, thus making the cyst-cavity extraperitoneal and draining it. If the cyst is rendered extraperitoneal and drained, it is sometimes found that, after a period of prolonged discharge, the patient recovers owing to the destruction of the secretory surface produced by the inflammation of the cyst-wall that always follows drainage; in other cases, however, great suppuration and necrosis of the cyst-wall ensue, to which the patient succumbs. (b) When the cyst fills a very large portion of the abdominal cavity and is universally and indissolubly adherent, he may deliberately sequester it by closing the incision in its wall and then that in the parietes, thus, except for the evacuation of its contents, leaving the patient *in statu quo*. If the cyst has been sequestered it will gradually refill and require subsequent tapping. (c) Occasionally it is possible to eviscerate the *tunica propria* of the cyst leaving the adherent ovarian capsule behind. If a plane of cleavage exists and the operator keeps within it there is no risk of tearing the adherent intestine or anything else. Before abandoning removal this should always be tried.

It is most important, therefore, for the operator carefully to consider, when dealing with an adherent cyst, whether there is a fair chance of

being able to remove it, and if he concludes that there is not, he had better treat it by one of the methods just described than endeavour to remove it, lest in the attempt he inflict such injuries on the mesentery, bowel, or large abdominal veins that the patient succumbs.

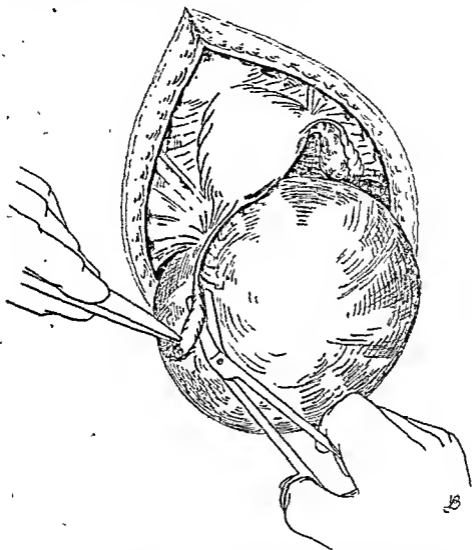


Fig. 472.—Ovariectomy with conservation of the Fallopian tube.

Nothing requires more experience, or wiser judgment, in abdominal surgery than to decide when not to remove an ovarian cyst after it has been emptied of its contents.

Hysterectomy and ovariectomy.—In cases of papillomatous or obviously malignant cysts, or solid tumours of both ovaries, or even in cases in which malignancy may be reasonably suspected, it is advisable to remove the uterus in addition. Hysterectomy may also be occasionally necessary in order to arrest hæmorrhage, or to facilitate

the removal of adherent ovarian tumours. At times a myoma of the uterus may co-exist with an ovarian cyst or cysts. If one ovary only has to be removed, myomectomy may be the preferable operation but, if both ovaries have to be removed, the conservation of the uterus is not necessary.

CONSERVATION OF THE FALLOPIAN TUBE

In the method of performing ovariectomy which we have described, the Fallopian tube is clamped with the rest of the pedicle and removed with the cyst. In elderly women, or in women who do not want children, this is the correct method of dealing with the Fallopian tube, but in young women it should always be preserved unless the cyst is malignant.

Operation.—After the cyst has been delivered, if the Fallopian tube is to be conserved, it should be dissected off the surface of the cyst-wall until it is clear of the cyst-pedicle, after which the cyst is removed in the way described (Fig. 472). The Fallopian tube, thus conserved, is always very long and, moreover, along the line of the cut mesosalpinx various small vessels will be found bleeding. These vessels should be ligatured and then a puckering suture (*see p. 38*) should be run along the cut edge of the mesosalpinx, so as to buckle up and shorten the tube.

ENUCLEATION OF A BROAD-LIGAMENT CYST

General characteristics.—All broad-ligament cysts have certain general characteristics, namely, the Fallopian tube is stretched over them, they are covered with shiny peritoneum, and, except those growing from the outer third of the mesosalpinx, they have no pedicle.

The relations of a broad-ligament cyst are very variable, and depend upon the site of its origin and its size.

These cysts may start in three different positions, as follows:

1. In the mesosalpinx.
2. Between the ovarian and uterine arteries in the broad ligament.
3. Under the uterine arteries.

1. When growing from the inner two-thirds of the mesosalpinx the cysts are sessile; when from the outer third, pedunculated. The ovarian vessels in either case lie on the deep surface of the cyst. Such tumours can therefore be removed without wounding the ovarian artery; they are accessible, and, except for adventitious adhesions, are easily dealt with.

2. If the cyst starts between the ovarian and uterine vessels, it forces its way upwards until the ovarian vessels and Fallopian tube lie sessile on its upper surface and in close relation with each other, the vessels often being spread out.

At a later stage the tumour grows backwards, progressively stripping

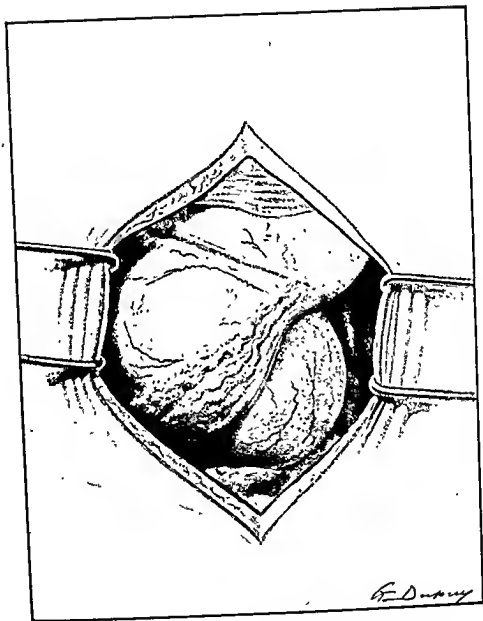


PLATE XII.—Broad-ligament Cyst of the Left Side.

the peritoneum and ureter from off the lateral pelvic wall so that the posterior layer of the broad ligament is gradually displaced towards the opposite side, and in time the pouch of Douglas is entirely obliterated. When this happens, adhesion occurs between the contiguous peritoneal surfaces covering the cyst, the back of the uterus, and the opposite broad ligament. During this process the cyst makes its way between the layers of the mesosigmoid and underneath the peritoneum covering the rectum, until the bowel comes to lie sessile on its upper and inner

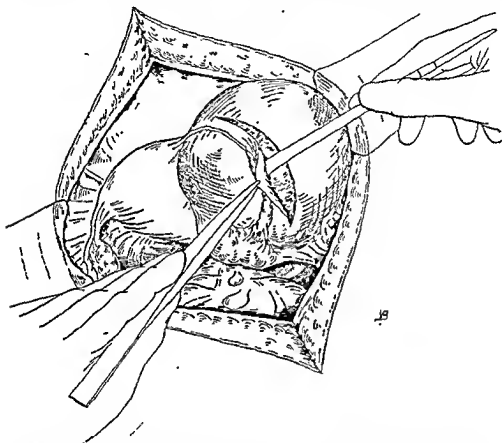


Fig. 473.—Removal of a broad-ligament cyst: Reflecting the peritoneum.

surface. The relation of the ureter and the iliac vessels to such a cyst is most important. The ureter lies on its inner surface closely attached to the peritoneum, while the iliac vessels are on its outer side.

3. If the cyst starts below the uterine vessels, these, as well as the ovarian vessels, run across on its upper surface, as does also the ureter, and the cyst tends to push down along the side of the vagina. These cysts, if they attain a large size, cross the middle line under the peritoneum at the bottom of Douglas's pouch, which is obliterated from below upwards as the peritoneum is forced off the posterior surface of the uterus. The general displacement of the parts is very similar to that which obtains in the preceding variety, but is distinguishable by the

position of the uterine vessels and ureter. The second and third varieties of these cysts at times, by crossing the middle line, give the appearance of involving both broad ligaments. The anatomical displacements are so varied and intricate that no two cysts have exactly the same relations, and a very careful inspection of the tumour, with reference to the points we have mentioned, should first be undertaken before its removal is commenced.

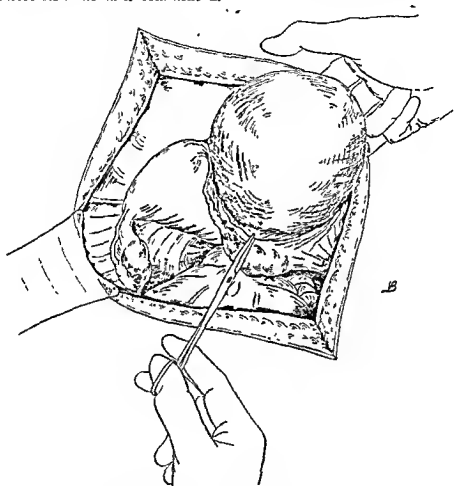


Fig. 474.—Enucleating the cyst.

Preparation of the patient.—See p. 78.

Instruments.—See p. 274.

Operation. i. **Opening the abdominal cavity.**—See p. 274. On passing the hand into the peritoneal cavity to ascertain the relations of the cyst, the operator will discover that the tumour has no pedicle, and that it cannot be delivered. On examining its upper surface, the capillary vessels of the stretched peritoneum are seen, together with the Fallopian tube, running across it, and in the case of the second

and third varieties the ovarian vessels or ovarian and uterine vessels as well.

ii. *Incising the broad ligament.*—At a spot on the surface of the cyst where blood-vessels appear least numerous, the broad ligament is opened by lightly incising with a scalpel the layer of peritoneum covering the cyst.

If this incision is made too deeply the cyst-wall will be wounded, the contents will escape, and as a result much greater difficulty will be experienced in removing the cyst.

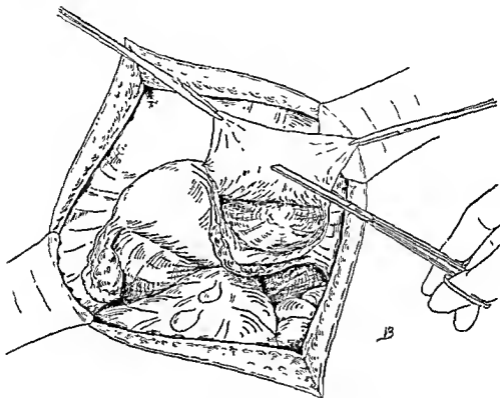


Fig. 475.—Removing redundant peritoneum.

iii. *Enucleation.*—The opening in the broad ligament is now sufficiently enlarged with the fingers, and by their means, aided by the handle of a scalpel, or by scissors if necessary, the peritoneum is reflected (Fig. 473), and the cyst is shelled out (Fig. 474).

During this procedure the operator should follow the path of least resistance, but keep as near to the cyst-wall as possible, so as to avoid tearing the broad ligament or damaging any other important structures. Any bleeding spots are caught with forceps for the time being, and can later be ligatured.

If the tumour is very large, it may be convenient, having partially separated it, to tap the cyst before attempting its complete enucleation.

iv. *Cutting away the redundant peritoneum.*—The redundant peri-

toneum having been cut away with scissors (Fig. 475), it will often be found that the cavity from which the cyst was removed is so much diminished that it can be closed with a single layer of sutures.

v. Closure of the cavity in the broad ligament.—(a) If the cavity is small, and all oozing of blood has stopped, the cavity is closed by a

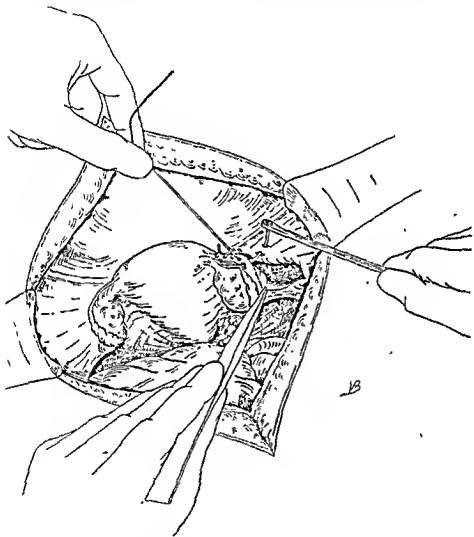


Fig. 476.—Suture of the enucleation cavity.

continuous catgut suture infolding the cut edges of the peritoneum Lembertwise (Fig. 476).

(b) When, however, the cavity extends into the depths of the broad ligament, its deeper part may be obliterated by mattress-sutures as shown on p. 424, Fig. 315. Great care must be taken not to puncture the uterine vessels, or to include the ureter or bladder in the suture.

When the cavity is very large it may be impossible entirely to obliterate it, and there is then a risk of hæmorrhage into it.

The steps of the enucleation just described will be the same, *mutatis mutandis*, when enucleating any other tumour that has distended the broad ligament, such as a broad-ligament myoma, or the mass formed by a tubal gestation that has ruptured into the broad ligament.

vi. Closing the abdominal cavity.—See p. 286.

Dangers. i. Hæmorrhage.—More blood must of necessity be lost during the enucleation of a broad-ligament cyst than in removing a simple ovarian tumour, but, as a rule, the oozing from the walls of the broad ligament is of no serious consequence, although occasionally it may be so severe as to necessitate special treatment.

If the ovarian vessels are stretched out over the surface of the tumour, it is often better, before enucleating the cyst, to ligature them at their uterine and pelvic ends and then divide them. Sometimes the cyst will be easily enucleated till the operator gets to its base, when he finds that it is held by some tough structures, generally uterine vessels, which, if cut without previous clamping with forceps, may give rise to troublesome bleeding.

Lastly, the bleeding from the bed of the cyst is at times too free to allow closure of the cavity, for fear of blood subsequently collecting. If there is any danger of this, the peritoneal capsule of the cyst must be sutured to the abdominal wound so that the cavity becomes extra-peritoneal; the cavity is then packed with gauze, soaked in 1-in-500 flavine, and drained.

ii. Injury to ureter or large veins.—Very often after a cyst has been enucleated the ureter will be seen lying across the base of the broad ligament, and the operator must always have in his mind the danger of wounding this structure when he is enucleating the tumour.

The ureter may also be displaced from its natural position, running over the upper surface of the cyst. If not recognized it will be, and often has been, divided. It can be recognized as a long tube about the size of a slate pencil, which slips beneath the fingers, and if it is carefully inspected for a few moments lumbricoid muscular contractions may be seen to take place in it.

When the cyst is very large it may spread over the brim of the pelvis, in which case the iliac arteries and veins will lie under its base and may be wounded.

Dressing and after-treatment.—See p. 24 and Chapter xxx.

Alternative methods of treating broad-ligament cysts.—Broad-ligament cysts growing in the outer surface of the mesosalpinx (mesosalpingeal cysts), being pedunculated, can be treated by the method of classical ovariectomy, though this involves the removal of the Fallopian tube. If it is desired to save the latter, the cyst should be enucleated.

It is not always possible to enucleate the cyst, owing to the adhesions between it and the cellular tissue of the broad ligament. In these circumstances it is sometimes possible to excise the cyst together with the portion of the broad ligament in which it grows, especially when it is one of those growing between the layers of the mesosalpinx. The cyst should be completely emptied by puncture, and the collapsed sac, together with that portion of the broad ligament covering it, is then pulled up out of the wound. The position of the ureter having been defined so far as possible, the upper part of the broad ligament is clamped, as is the uterine end of the broad ligament and Fallopian tube, and the tissue between the clamps is excised by a wedge-shaped incision. In many cases it is possible to remove the entire cyst in this way, but sometimes a small piece of its lower part is left behind. This, however, in our experience does not give trouble, the sac probably becoming obliterated like the tunica vaginalis after partial excision of a hydrocele. The two ends of the ovarian vessels having been secured, the cut edges of the incision in the broad ligament are united by interrupted mattress-sutures.

The ovary may or may not have to be removed during this operation. If possible, it should be conserved.

In those very formidable broad-ligament cysts which comprise the second and third varieties described (pp. 634-636), it is frequently impossible to remove the cyst without the gravest danger of wounding the ureter, bowel, and large vessels. In these circumstances the cyst-wall must be brought up to the abdominal incision and stitched to it, so that it becomes extraperitoneal. The cyst is then packed lightly with flavine gauze and drained, or, after being emptied, the hole in the cyst-wall may be sewn up and the cyst sequestered.

In other cases a certain amount of cyst-wall can be removed but not all. This having been done, the edges of the remaining portion must be sutured to the abdominal wound, and the cavity drained.

REMOVAL OF A PSEUDO-BROAD-LIGAMENT CYST

By a pseudo-broad-ligament cyst we mean an ovarian cyst which, instead of rising up out of the pelvis, has grown downwards and forwards under the posterior layer of the broad ligament, pushing and rotating the anterior layer of this structure upwards until it eventually forms a covering to the cyst, with the result that, when the abdomen is opened, the appearance presented resembles, to the inexperienced eye, that of a broad-ligament cyst. Consequently, much time and trouble are expended in trying to enucleate the tumour.

These cysts may be identified by noting that the ovary is not separate from the tumour, and that, while the anterior surface of the cyst is covered by the stretched peritoneum of the broad ligament,

with the Fallopian tube, ovarian vessels and round ligament running across it, the cephalward and posterior surfaces present the characteristics of an ordinary ovarian cyst. If the hand is passed down into the pelvis at the back of the cyst it will, in many cases, be found possible to scoop it out from under the stretched and rotated broad ligament, and subsequently to deal with it by the method of removal previously described. When it is very tightly incarcerated under the broad ligament, and particularly if it is very adherent, the following method should be adopted:

Operation. i. Opening the abdominal cavity.—See p. 274.

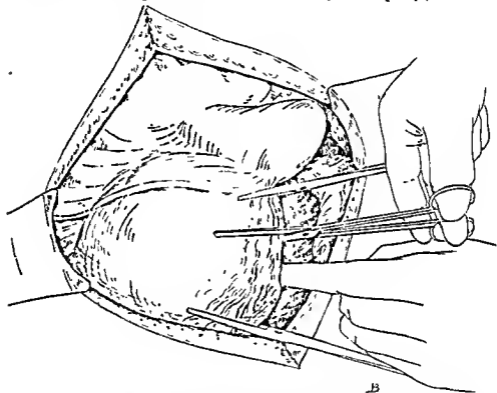


Fig. 477.—Ovariectomy for a pseudo-broad-ligament cyst: Dividing the top of the broad ligament.

ii. Dividing the stretched broad ligament.—The edge of the stretched broad ligament, which can be identified by the Fallopian tube, should be defined and separated from the upper surface of the cyst. A pair of pressure forceps is now applied in the neighbourhood of the uterus, and another about an inch externally to it; each of these should include the leash of ovarian vessels which is seen running over the surface of the tumour. The broad ligament covering the tumour is then divided with scissors as far as the pedicle of the tumour, i.e. the hilum of the ovary, which forms the limit of separable attachment between the broad ligament and the upper surface of the tumour (Fig. 477).

iii. Delivering the tumour.—The operator places his left hand underneath the tumour, now freed from the tethering broad ligament, and gradually levers it up and delivers it through the abdominal incision (Fig. 478).

iv. Tying the ovarian pedicle.—The pedicle is transfixed with No. 4 silk, and that portion of it nearest the uterus is secured, the assistant at the same time pulling into the grasp of the ligature the inner half

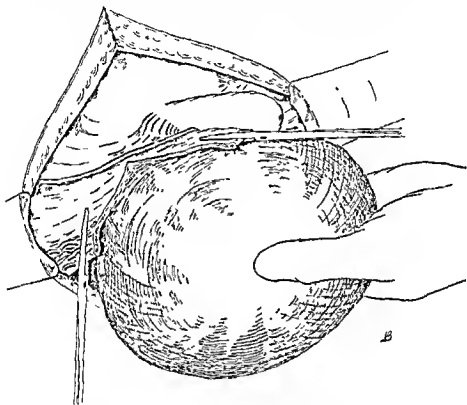


Fig. 478.—Delivering the freed tumour.

of the previously divided broad ligament. After this the cyst is raised right up by the assistant, and the other half of the ligature is tied in a similar way, the outer half of the cut broad ligament being included, and the cyst is then cut away. The pedicles may now be buried by one of the methods described at p. 48.

v. Closing the abdominal cavity.—See p. 286.

Difficulties and dangers.—The dangers are similar to those of ordinary ovariectomy (p. 630). It should be remembered that the ureter lies on the outer side of such cysts; not on the inner, as in a true broad-ligament cyst.

Dressing and after-treatment.—See p. 24 and Chapter xxx.

CHAPTER XXIV

OPERATIONS ON THE UTERINE APPENDAGES

Indications.—The uterine appendages, either in whole or part, may be removed for diseases of the tubes and ovaries, such as acute and chronic salpingitis, tuberculous salpingitis, pyosalpinx, hydrosalpinx, hæmato-salpinx, tubo-ovarian cyst and abscess, and for carcinoma of the tube, tubal gestation, and endometriosis.

The operation of salpingo-oöphorectomy has been much abused, owing to its performance in cases in which a salpingotomy or salpingostomy would have sufficed. The reasons for conserving the ovary have been discussed at p. 611. The ablation of a healthy ovary merely to increase the facility of removing a diseased tube is absolutely unjustifiable, and even when the ovary contains an abscess it is possible and often proper to conserve it (*see* p. 648). The operation of salpingo-oöphorectomy is most often indicated in those cases of inflammatory disease of the Fallopian tube, secondarily involving the ovary, in which both structures are destroyed beyond the reach of conservative surgery; in tubal gestation in which the ovary is destroyed; and in ovarian gestation in which the Fallopian tube is damaged. It is sometimes advocated in cases of intractable dysmenorrhœa not associated with gross changes in the ovary, the so-called "ovarian dysmenorrhœa"; and undoubtedly, if the pain can be definitely proved to be located in the ovaries, the removal of these organs would be a logical procedure to relieve it. We are, however, unacquainted with any recorded case in which monthly attacks of ovarian pain recurred after the removal of the body of the uterus, and our belief is, therefore, that the pain in all, or almost all these cases of dysmenorrhœa is of uterine origin. If so, subtotal hysterectomy, not oöphorectomy, is the proper operation.

When the appendages are very adherent, salpingo-oöphorectomy may become one of the most difficult in surgery; in fact, in exceptional cases so firm may the adhesions be that the operation has to be abandoned.

In most of the conditions mentioned above the disease is bilateral, though one appendage may be more disorganized than the other, with the consequence that the operation indicated on one side differs from that indicated on the other.

SUBTOTAL SALPINGECTOMY

Salpingectomy is always preferable to the more radical operation if it can possibly be performed, except in malignant disease of the tube when the ovary, and very probably the uterus as well, will have to be removed.

Salpingectomy is indicated when the Fallopian tube is irretrievably diseased but the ovary is healthy or, being diseased, is yet capable of being conserved (see p. 666). It is contra-indicated in cases of malignant disease of the tube, in which case the uterus and ovary in addition should be removed. In certain cases of hydrosalpinx and hæmatosalpinx the conservative operation of salpingostomy is preferable, while in suppurative salpingitis in young women when the tube is not distended or much thickened, simple drainage may be preferable.

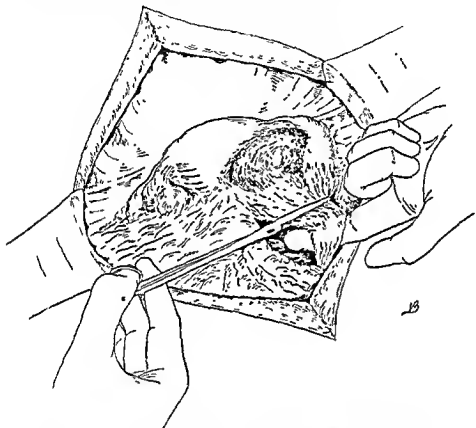


Fig. 479.—Subtotal salpingectomy:] Separating adherent omentum.

Preparation of the patient.—See p. 78.

Instruments.—See p. 274.

Operation. i. Opening the abdominal cavity.—See p. 274.

ii. Defining the appendages.—The left hand of the operator is passed through the incision and the condition of the pelvis explored. In this procedure the fundus of the uterus should be first identified.

When the inflammation has been extensive, instead of the intestines slipping back so as to disclose the pelvic organs, all that the operator sees is either the omentum with its lower edge fixed in the region of

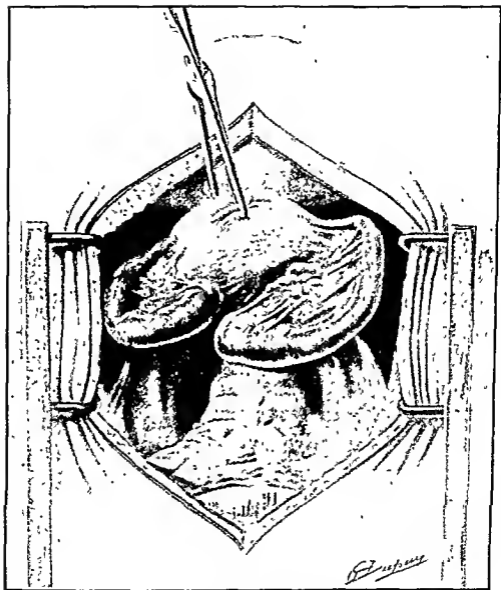


PLATE XIII.—Bilateral Hydrosalpinx.

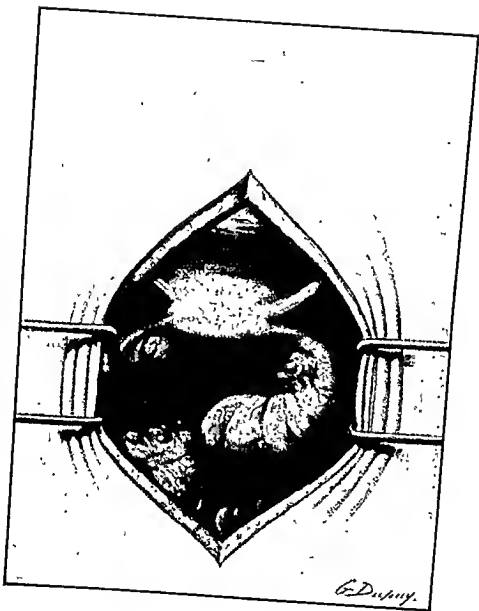


PLATE XIV —Bilateral Pyosalpax.

the pubes, forming a lid to the pelvic cavity, or coils of intestine matted together and fixed in the same position. On trying to pass his hand into the abdominal cavity, he will perhaps find that the omentum or intestine is adherent to the abdominal parietes or to the fundus of the bladder, or that some coils of small intestine are adherent to the anterior surface of the uterus or to the Fallopian tubes. The pelvic colon is almost invariably adherent by its appendices epiploicæ to the diseased appendages, particularly on the left side.

iii. Separating and dividing the adherent omentum and superficial intestinal adhesions.—If any omental bands are present, these should first be clamped with forceps, divided and tied. If the omentum is entirely adherent it must be ligatured off in small pieces, as shown in Fig. 479. The more superficial of the intestinal adhesions are then separated.

In many cases the appendix will be found adherent to the Fallopian tube on the right side, in which case it should be carefully separated. The question of its removal requires consideration. When the case is a clean one and the patient's condition satisfactory, it should be removed lest fresh adhesions should form, which might lead to appendicitis. If, however, the case is an acutely infected one and the patient's condition bad, the appendix should not be removed, since such a course would definitely add to the immediate risk of the operation.

iv. Packing off the intestines.—The swabs necessary for this purpose are now inserted (p. 282), and the separation of the deeper and more formidable adhesions may then be proceeded with, without much fear of infection of the general peritoneal cavity in the event of a distended tube rupturing.

v. Separation of the diseased Fallopian tube or tubes.—If the disease is bilateral, which appendage is first dealt with may be a matter of little consequence, but if that of one side is obviously easier to separate than that of the other, then it should be dealt with first, in order that additional room may be available for the removal of the more adherent one.

The dilated Fallopian tubes are always found curled downwards and backwards, adherent to the posterior surface of the uterus, the floor of the pelvis, the posterior surface of the broad ligament and, not seldom, to the anterior surface of the rectum and the pelvic colon; while on many occasions the operator will find that the Fallopian tubes have in addition become adherent to each other, thus entirely filling Douglas's pouch and surrounding the uterus behind.

On account of the important structures which may be adherent to the diseased appendages, the separation must be most cautiously proceeded with, and every care also should be taken to prevent rupture of the pyosalpinx and the escape of pus.

It is best and easiest, therefore, to commence the process of separation with the index-finger of each hand, first freeing the upper and superficial part of the tube (Fig. 480).

The completion of the separation of the tube, in its deeper parts, is effected by passing the index and middle fingers of the left hand down to the floor of the pelvis, and then insinuating their tips, with the palmar surfaces forwards, under the lowest part of the swelling,

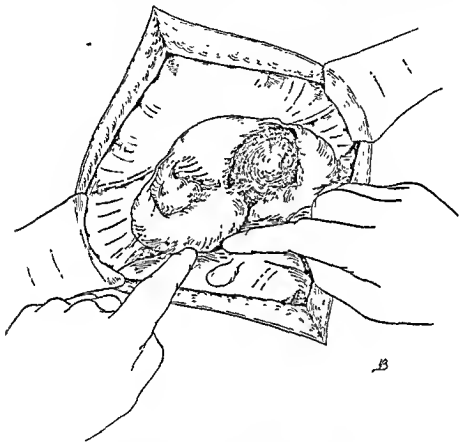


Fig. 480.—Separating the Fallopian tube.

below the situation where the ovarian ligament joins the uterus. By flexing and unflexing the fingers, the adhesions are gradually separated from below upwards; and it may be advantageous to clamp some portion of the appendage with ring forceps and pull it up with the right hand during the manipulations of the left hand (Fig. 481).

The facility with which the separation is performed depends largely on an appreciation of the anatomical deformity which the parts have undergone in consequence of the disease, and on the educated sense of tissue-appreciation which guides the manipulating fingers in the right plane of cleavage.

The dilated tube having eventually been delivered through the abdominal opening, it is removed, as follows :

vi. Removal of the dilated Fallopian tube.—The dilated tube being raised in the right hand, a pair of pressure forceps is applied to the ovarian fimbria and outer edge of the mesosalpinx, parallel to the course of the Fallopian tube and about a quarter of an inch from it.

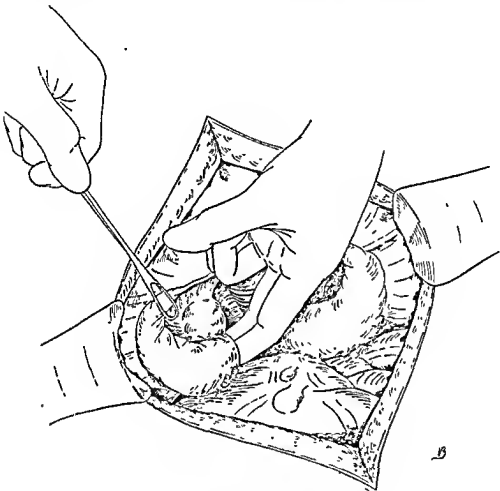


Fig. 481.—Raising the Fallopian tube.

A pair of pressure forceps is also applied at the junction of the tube with the uterus.

The dilated tube is then removed with scissors, commencing at its uterine end, pressure forceps being applied to the divided mesosalpinx not already clamped (Fig. 482).

vii. Ligature of the mesosalpinx.—The mesosalpinx, with any bleeding-vessels therein, is now ligatured by a series of interrupted catgut mattress-sutures, except its outer end which is secured by passing the ligature round the forceps holding it (Fig. 483).

viii. Inspection of the ovaries.—When the operation is being performed for acute salpingitis or pyosalpinx, it is important to be certain that the ovaries do not contain an abscess. This can be ascertained by stabbing

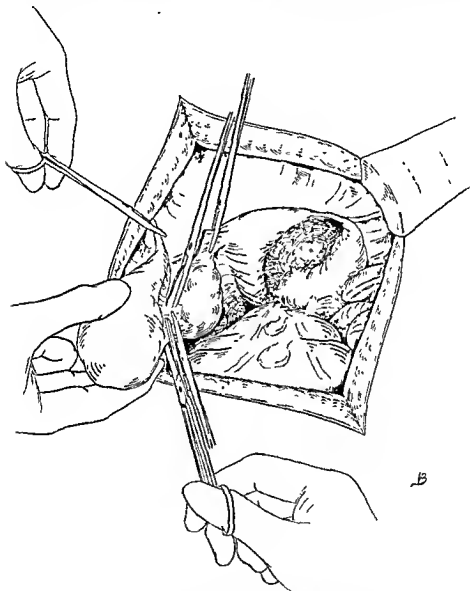


Fig. 482.—Removing the Fallopian tube.

them in several places with the scalpel. An ovary in which pus is found can be removed, but when the patient is a young woman, as she usually is, sooner than remove the ovary, it is better to open up the abscess and let it drain through the drainage tube subsequently inserted into the bottom of the pelvis.

ix. Drainage and closing the abdomen.—*See* pp. 49 and 286.

Dressing and after-treatment.—*See* p. 24 and Chapter xxx.

SALPINGO-OÖPHORECTOMY

i. Elevating the distended Fallopian tube and cystic ovary.—The superficial adhesions having been separated, the index and middle

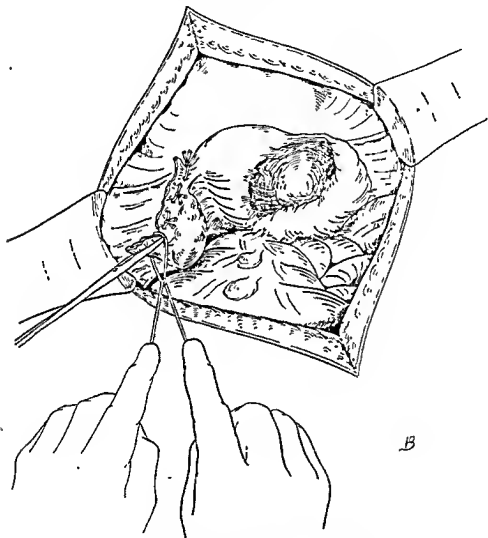


Fig. 483.—Ligaturing the mesosalpinx.

fingers of the left hand are inserted under the mass formed by the diseased ovary and tube and these are carefully separated from the structures to which they are adherent as described under subtotal salpingectomy (Fig. 484).

ii. Clamping the ovario-pelvic ligament and then dividing it.—By a pair of pressure forceps the ovario-pelvic ligament on that side

is clamped near the pelvic brim and the ovarian artery and vein are thus temporarily secured (Fig. 485). The ligament is now severed with scissors, distally to the clamp, and the outer attachment of the appendage is thus freed. This incision should not extend more than an inch along the edge of the broad ligament.

iii. Removing the diseased appendage.—The partially separated mass is now held up with the left hand and the remaining attachment of the appendage, consisting of the Fallopian tube, the ovario-uterine

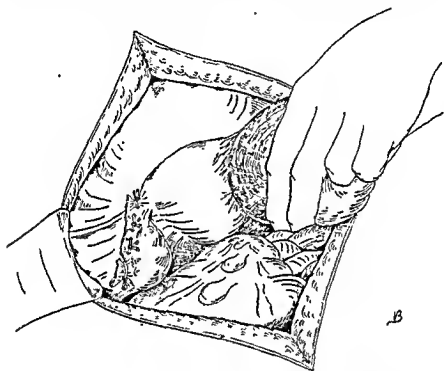


Fig. 484.—Salpingo-oophorectomy: Raising the appendage.

ligament, and the undivided portion of the broad ligament is clamped by a pair of pressure forceps and the mass removed by the scissors (Fig. 486).

iv. Ligature of the divided broad ligament.—The ovario-pelvic ligament is now ligatured with a No. 1 catgut ligature by transfixing it beneath the ovarian vessels, tying the ligature over the free edge of the ligament and then bringing it back to the other side of the pedicle and tying it again, so as to make the ligature an occluding one (see p. 42). The ovario-uterine ligament is secured by transfixing the broad ligament underneath it and tying the ligature on the free edge of the Fallopian tube. If the ovario-uterine ligament is separated by a good distance from the tube it is better to ligature it separately

(Fig. 487). The broad area of broad ligament which intervenes between the ovario-pelvic and ovario-uterine ligaments, is then secured by two or more mattress-sutures.

v. *Burying the stump.*—The stump may now be buried by one of the three methods already described at p. 48.

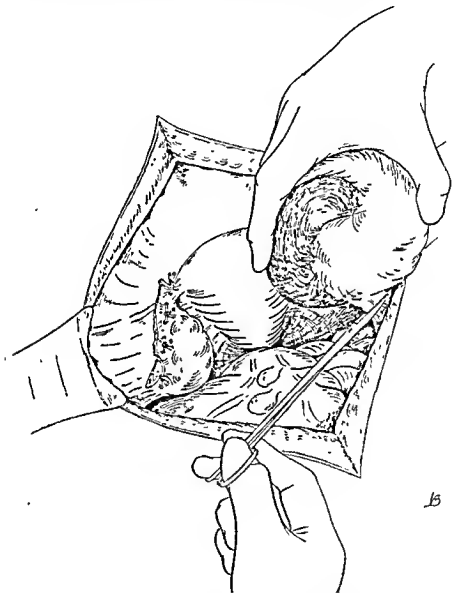


Fig. 485.—Clamping the ovario-pelvic ligament.

It is not always possible to do this, however, for in bad cases peritoneum is not available, owing to its destruction by the inflammatory process and the manipulations necessary to free the diseased appendage. In cases such as these, large raw surfaces are unavoidably left, unless the uterus is removed as well, in which event the usually healthy

peritoneum covering the front of the broad ligaments, the supravaginal cervix, and the bottom of the utero-vesical pouch becomes available to cover the denuded areas in the posterior part of the pelvis.

vi. Drainage.—See p. 49.

vii. Closing the abdominal cavity.—See p. 286.

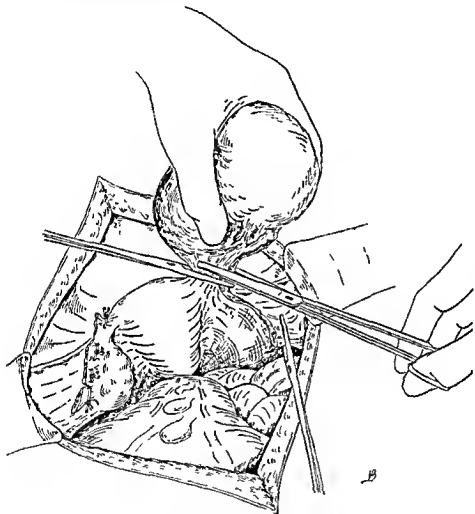


Fig. 486.—Removing the appendage.

Dressing and after-treatment.—See p. 24 and Chapter xxx.

Difficulties.—The chief difficulty of the operations described is entirely due to the number and strength of the adhesions, and to deal with these the skill and ingenuity of the operator may be taxed to the utmost. If the adhesions are recent they will be soft and may be separated quite easily, but if the peritonitis is of old standing, then the adhesions will be tough, and their separation may even be impossible.

In advanced cases scissors may be necessary to divide adhesions, more especially those in the neighbourhood of the ovario-uterine ligament, which, on account of inflammatory thickening and contraction, may anchor the diseased structures to the side of the uterus, and may have to be separately divided to set the mass free. Further, when the

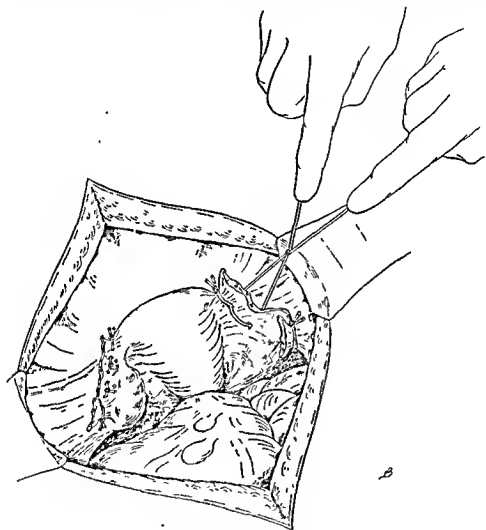


Fig. 487.—Ligaturing the uterine end of the ovarian vessels.

ovario-pelvic ligament is greatly thickened, there is a danger of the ureter having become attached to or included in the thickening, in which case it is very likely to be injured or cut right across when the ligament is divided.

Total salpingectomy.—If total removal of the tube, as well as of the ovary, is desired, the operation described must be so modified as to include the excision of a wedge-shaped portion of the uterine cornu (see Total Salpingectomy, p. 660).

SALPINGO-OOPHORECTOMY WITH BISECTION OF THE UTERUS

In very difficult cases of double pyosalpinx, when the dilated Fallopian tubes are adherent to one another and to the floor of the pelvis, the apparent impossibility of separating the diseased structures by the usual method can be surmounted by dividing the uterus down

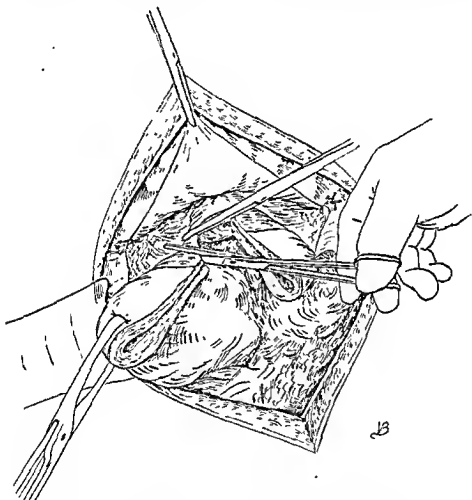


Fig. 486.—Salpingo-oophorectomy with bisection of the uterus: Securing the uterine artery on the left side.

the middle and removing each half with its corresponding appendage, a method devised by Faure and described in the following paragraphs.

Operation. i. Opening the abdominal cavity.—See p. 274.

ii. Defining the appendages.—See p. 644.

iii. Separating and dividing the adherent omentum and superficial intestinal adhesions.—See p. 645.

iv. Insertion of the swab.—See pp. 282 and 645.

v. Division of the round ligaments and separation of the peritoneum and bladder.—The round ligaments having been ligatured and divided about an inch from the uterus, the peritoneal incisions dividing them are joined across the middle line, and the peritoneum and bladder pushed off the supravaginal cervix.

vi. Bisection of the uterus.—A volsellum is then fixed to each cornu of the uterus, which is divided by an incision down the middle line as far as the internal os.

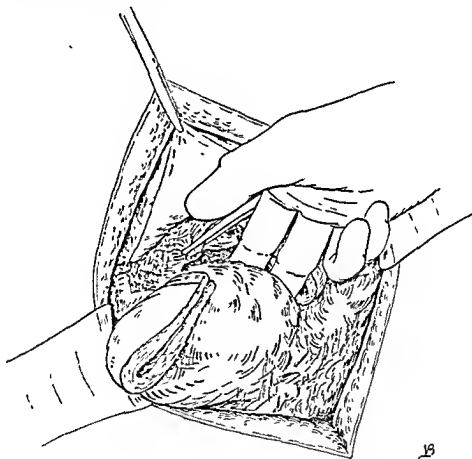


Fig. 489.—Raising the adherent appendage.

vii. Amputation of the body of the uterus.—One half of the uterus is now amputated transversely with a pair of scissors, the uterine artery being clamped as it comes into view (Fig. 488).

viii. Removal of each half of the uterus with its corresponding diseased appendages.—The half of the uterus being thus freed, the fingers of the left hand can lift it up to some extent and so get under the mass formed by the diseased appendage (Fig. 489), which will now be very much more easily separated from the structures to which it is adherent.

As the mass composed of half of the uterus and appendage is raised out of the pelvic cavity, the upper part of the broad ligament

is put on the stretch and clamped, and the appendage, together with its corresponding half of the uterus, is then cut away.

The other diseased appendage and half of the uterus are now similarly treated.

ix. Ligature of the ovarian and uterine vessels.—The uterine and ovarian vessels on either side, already clamped, are now ligatured in the manner described at pp. 301-310.

The hysterectomy in this case is subtotal. If it is desired to remove the whole of the uterus, the bladder must be separated entirely from the supravaginal cervix after the preliminary incision of the peritoneum across the front of the uterus has been made. The splitting incision is then carried right down the posterior wall until the vagina is opened, and, the fingers of the left hand having been inserted therein, the anterior wall is divided to the same extent. Each half of the cervix is cut free from its lateral attachment to the vagina and gradually separated from the broad ligament from below upwards, the uterine artery being seized as it presents or spurts.

When the removal of the uterus is carried out to facilitate the extirpation of the diseased appendages the subtotal operation will suffice, but when it is undertaken because the uterus is also diseased the hysterectomy should be total. In such circumstances preliminary splitting of the uterus should not be done unless it facilitates the operation, but the technique described at p. 318 should be followed.

Finally, there are cases in which, after the separation of the appendages, the uterus is left so lacerated and oozing as to forbid its being conserved. In such circumstances the subtotal operation is generally the best.

Ventralfixation.—When salpingectomy or salpingo-oophorectomy has been carried out for inflammatory disease of the appendages, and especially for pyosalpinx, it is often advantageous to ventralfix the uterus, using catgut and not silk sutures. The reason for this is the fact, to which we believe we were the first to call attention, that after salpingo-oophorectomy the uterus falls back into the hollow of the sacrum and becomes fixed there by adhesions. As a result, the patient does not obtain that benefit from the operation which was anticipated (*see* p. 933).

Further, the anteverted position has two other advantages; it allows better drainage in those cases in which an india-rubber tube has been inserted through the abdominal wound, and it keeps the conserved ovary or ovaries out of the pelvis, and so prevents them from becoming adherent and degenerate there.

Dangers of salpingo-oophorectomy.—In separating the adhesions—

- i. The intestines may be wounded.
- ii. Pus may escape into the upper peritoneal cavity.
- iii. Large vessels may be opened.

- iv. Bleeding from the raw surfaces may be severe.
- v. The bladder or ureter may be injured.
- vi. The broad ligament may be opened up.

i. Wounding intestine.—The rectum may be wounded, or the colon, or the small intestine—most commonly the colon. The wound may extend through the peritoneal coat only, or through the muscular coat also, or the lumen of the bowel may be opened, or even the whole bowel torn across. Generally it is the peritoneal covering alone that is injured, when, as a rule, no harm results, although a path is thus left for intestinal bacteria to escape and perhaps set up peritonitis, or the injured wall may slough and a faecal fistula result. Both of these complications are more likely if the muscular coat is damaged. If the lumen of the bowel is opened and escapes detection, a fatal peritonitis results, or, at least, a *faecal fistula*.

The treatment depends on the amount of injury. If the peritoneal coat is simply abraded, it had better be let alone, since it is usually impossible satisfactorily to suture it, but all bleeding-points must be tied. If the muscular coat is injured or the bowel opened, the wound must be repaired according to the directions given at p. 782. In any case, an india-rubber drainage-tube must be left in the pelvis for 3 days at least (*see* p. 49).

ii. Escape of pus.—If a pyosalpinx or a tubo-ovarian abscess is ruptured during the manipulations, the contents will escape, and it is then advisable to lower the patient into a more horizontal position to obviate the risk of any pus escaping past the swabs. The pus should be carefully removed with swabs, and the swabs which have been previously packed round the diseased area in anticipation of this accident should not be removed until it is time to close the abdominal incision, for fear of soiling the rest of the abdominal contents.

Irrigation of the pelvic cavity does no good, and may do harm by distributing pus over the abdominal cavity. If pus escapes, the result will depend upon its nature. In recent cases, as for instance an acute pyosalpinx following abortion, the pus is very infective, and drainage is a necessity. Penicillin and sulphathiazole powder should be applied locally.

In a very large majority of chronic cases the pus is sterile; no harm results from its escape, and many operators do not consider it advisable to drain. On nearly every occasion, both at the Middlesex Hospital and at the Chelsea Hospital for Women, in which the pus from chronic cases has been examined bacteriologically, organisms have been absent; and this experience is confirmed by that of most other observers.

We think, however, it is best, whenever pus is present, to pass a drainage-tube down into the pelvis (*see* p. 49).

iii. Injury to vessels.—It often happens that some part of the appendage is adherent to the brim of the pelvis, and in separating the

adhesions great caution is necessary lest the iliac vein be injured. This accident is fortunately rare. If it occurs, a swab must be at once pressed over the bleeding area to prevent the further escape of blood and then, as the swab is raised, the operator secures the opening with a pair of pressure forceps, after which the vein must be ligatured. As obstruction of the iliac vein is such a serious matter, a lateral ligature should be applied if possible. In cases in which the broad ligament is contracted from inflammation so that it cannot be drawn up, the iliac vein may be transfixed by the needle while securing the ovarian vessels. A retroperitoneal hæmatoma will at once occur, and must be dealt with (p. 47).

iv. *Serious oozing.*—After the removal of the diseased structures, raw oozing surfaces, where the adhesions have been separated, will come into view. The positions at which these raw surfaces are most marked are the floor of the pelvis, the anterior surface of the rectum, and the posterior surfaces of the uterus and broad ligament. In most cases the oozing of blood soon stops, and special treatment is not necessary, but in some the bleeding is free, blood welling up into the pelvic cavity as soon as the swab is removed. A careful search, aided perhaps by a hand-lamp, must now be made to ascertain if there is any particular point from which the bleeding is coming, and if such a one is discovered it should be secured with a ligature tied over the forceps or with a mattress-suture. At times the bleeding due to the separation of the adhesions on the posterior surface of the uterus may be so severe that it can only be arrested by hysterectomy. If the bleeding-point happens to be on the rectum, care must be taken not to include more of the bowel-wall in the ligature than can possibly be avoided. If the condition is one of general oozing rather than of bleeding from a definite point, the loss may often be stopped by the application of swabs wrung out of boiling water. If this method is not sufficient, it only remains to pack the bleeding area with flavine gauze, which is removed in 24 hours. This step, however, is very rarely required.

v. *Injury to the bladder.*—In some cases of pyosalpinx the inflammatory mass may actually raise the whole bladder out of the pelvis, so that it runs some risk of being wounded when the peritoneal cavity is being opened.

When a large mass can be felt on abdominal examination jutting up above the pubes, the danger of wounding the bladder is particularly to be borne in mind. In other cases the bladder may be adherent over the top of the uterus to the omentum, intestine, or the diseased Fallopian tubes themselves, and may be torn in the process of separation. In either event the wound must be immediately closed by the method described at p. 777.

vi. *Wounding the broad ligament.*—Frequently the diseased appen-

dages are so adherent to the back of the broad ligament that in separating them the peritoneum is torn away and a hole is left, exposing the cellular tissue, from which marked bleeding may take place. This hole must be closed by one or more mattress-sutures.

vii. **Ligaturing or dividing the ureter.**—Just where the ovario-pelvic ligament is in relation with the brim of the pelvis the ureter is very superficial, and can be felt quite easily by rubbing the tissues between the finger and thumb. Care must therefore be taken, when ligating the ovarian vessels in this situation, not to include the ureter, and also when dividing the ovario-pelvic ligament not to divide the ureter as well.

It is also to be remembered, when closing rents in the broad ligament, that the ureter is closely adherent to the posterior peritoneal layer, and is in danger of being transfixed by the needle or included in the ligature.

Hysterectomy in cases of double appendage disease.—Many authorities maintain that in cases of disease of both appendages requiring the removal of both tubes the uterus should always be removed as well, because it is sure to be diseased, can be of no further use, and may be a source of future trouble. There can be no doubt that a conserved uterus after bilateral salpingo-oöphorectomy for pyosalpinx may be a source of a chronic purulent discharge, especially in gonococcal cases, while in some instances severe hæmorrhages may periodically occur from it. On the other hand, the uterus often is apparently healthy, in spite of the presence of a double pyosalpinx, especially in old-standing cases not of venereal origin. Further, the removal of the uterus, especially when this is total, increases the severity of the operation, and opens up planes of healthy connective tissue to probable infection.

We therefore think that the routine performance of hysterectomy in these cases is to be deprecated. If any portion of the ovary can be conserved it is well to leave the uterus, if possible. In chronic cases of double pyosalpinx not due to gonorrhœa, we should also content ourselves with removing the appendages only. In acute septic cases, again, in which the patient is very ill, we believe that it is the best practice to let the uterus alone, i.e. to do as little as is necessary, firstly for fear of opening up healthy pelvic tissues to acute infection, and, secondly, because these patients stand extensive operative procedures very badly. The cases most suitable for entire ablation of the uterus and adnexa are those of gonorrhœal pyosalpinx with chronic gonorrhœal metritis, evidenced by a purulent cervical discharge and a swollen, soft vascular condition of the uterus as viewed through the abdominal incision.

There are also certain cases in which it is an advantage to remove the uterus so as to obtain sufficient sound peritoneum to cover over the extensive raw surfaces left after separation of the appendages. This

is particularly so when the whole of the posterior surface of the uterus is denuded, with troublesome oozing.

'TOTAL SALPINGECTOMY

This operation is indicated especially in certain acute tubal infections where the pyosalpinx extends into the uterine cornu, and it has for its object the removal of the entire Fallopian tube as far as the uterine ostium (*see also* p. 687).

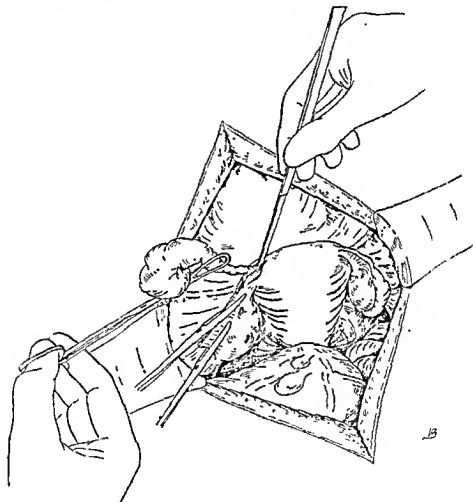


Fig. 490.—Total salpingectomy: Dissecting the tube out of the cornu.

Operation. i. Opening the abdominal cavity.—*See* p. 274.

ii. Separation and excision of the Fallopian tube.—The steps of this part of the operation are similar to those described under subtotal salpingectomy with the following exceptions: Pressure forceps are not applied to the uterine end of the Fallopian tube and the amputation is commenced at the ampullary end of the tube instead of the uterine end.

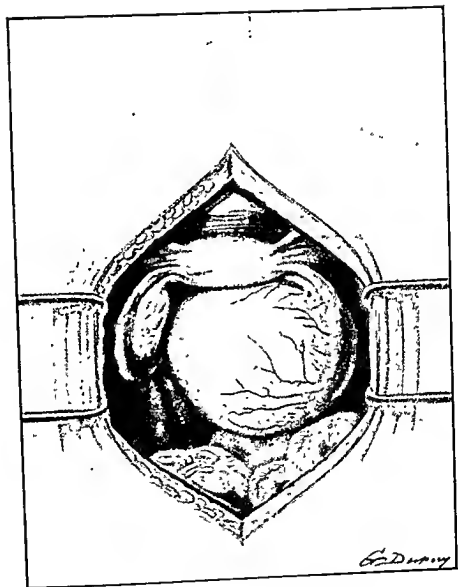


PLATE XV.—Right Tubo-ovarian Cyst.

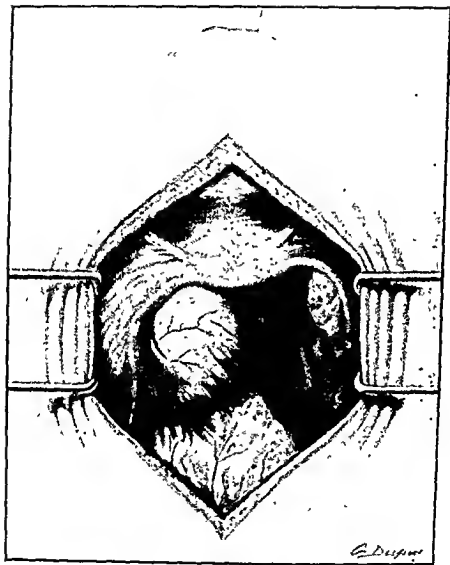


PLATE XVI — Large Ovarian Abscess of the Left Side

Instead, therefore, of clamping and amputating the tube at its junction with the uterine wall, a wedge-shaped portion of this latter, containing the interstitial part of the tube, is excised (Fig. 490), and the wound united with sutures of No. 1 catgut.

iii. Ligature of the mesosalpinx and uterine incision.—The hole in the cornu having been closed by the mattress-suture, like sutures are then inserted along the length of the mesosalpinx, except that part

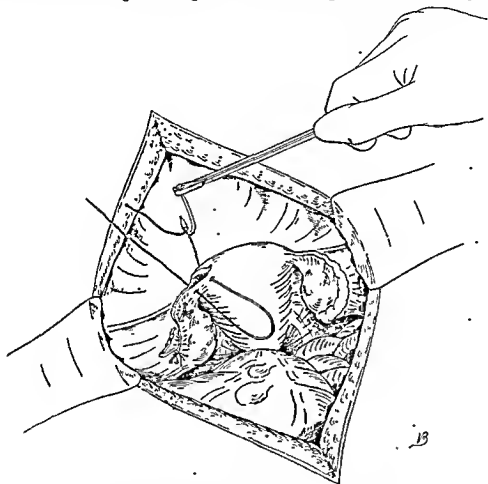


Fig. 491.—Suture of the mesosalpinx and cornu.

near its free border, which is secured by a simple surround ligature (Fig. 491).

iv. Closing the abdomen.—See p. 286.

OPERATION FOR TUBO-OVARIAN CYSTS AND ABSCESS

These two conditions often give rise to a displacement very similar to that of the pseudo-broad-ligament cyst (p. 640), i.e. the enlarged ovary tends to under-burrow the broad ligament, which is rotated and stretched over its upper (cephalward) and anterior surface. The edge of the stretched broad ligament is formed by the distended

Fallopian tube. In many cases the ovarian part of the mass is easily displaced from under the broad ligament, but not infrequently, especially in tubo-ovarian abscess, it may be so firmly fixed as to necessitate division of the broad ligament before it can be freed.

The technique described for pseudo-broad-ligament cysts is then to be followed, except that the division of this structure and the tube must be carried out right up at the uterine cornu, that is, across the non-dilated isthmic portion of the tube just as it leaves the uterus. Special care must be taken securely to clamp the distal end of the tube at its point of division, for otherwise the whole contents of the swelling will escape therefrom. For the rest, the steps of the operation are similar to those described for salpingo-oophorectomy (p. 649).

OVARIAN SUSPENSION

Indications.—Suspension of the ovaries is indicated in cases of ovarian prolapse causing dyspareunia, the uterus being in its normal position. It is indicated if the uterus is retroverted and the ovaries remain prolapsed in spite of the ventralfixation or shortening of the round ligaments. Lastly, it is a useful method to pursue when, after salpingectomy or salpingostomy for salpingitis, it is desired to lift the ovaries out of the bed of the adherent appendages.*

Preparation of the patient.—See p. 78. **Instruments.**—See p. 274.

Operation. i. Opening the abdominal cavity.—See p. 274.

ii. Pleating the ovario-uterine ligament.—The operator holds the ovary in his left hand and puts the ovario-uterine ligament on the stretch. With Reverdin's needle he then inserts a continuous pleating-suture through the ovario-uterine ligament, commencing at its ovarian end and ending at its uterine end.

iii. Pleating the ovarian ligament.—The two ends of the suture are then tied together, with the result that the ligament is thrown into pleats and the ovary assumes more or less its normal position (Fig. 492).

iv. Closing the abdominal cavity.—See p. 286.

Dressing and after-treatment.—See p. 24 and Chapter xxx.

TESTING THE PATENCY OF THE FALLOPIAN TUBES

In a case of sterility, when a gross cause cannot be found, the patency of the Fallopian tubes should be tested, as they may be obstructed.

THE VAGINAL TEST

This can be accomplished either as originally devised by Rubin by passing carbon dioxide through the tubes, or simply by using air. We

* Victor Donney, "The Treatment of Ovarian Prolapse by Shortening the Ovarian Ligament," *Lancet*, Dec. 22, 1906.

shall proceed to discuss the operation as we perform it with Bonney's apparatus for the injection of air. *It is of absolute importance to make sure the apparatus is gas-tight beforehand.*

Operation. i. Position of the patient.—The patient is placed in the lithotomy position.

ii. Testing the inflator beforehand.—This is essential for the accuracy of the test. The surgeon should compress the holes in the nozzle, squeeze the bulb and, by watching the manometer, note if the pressure is maintained.

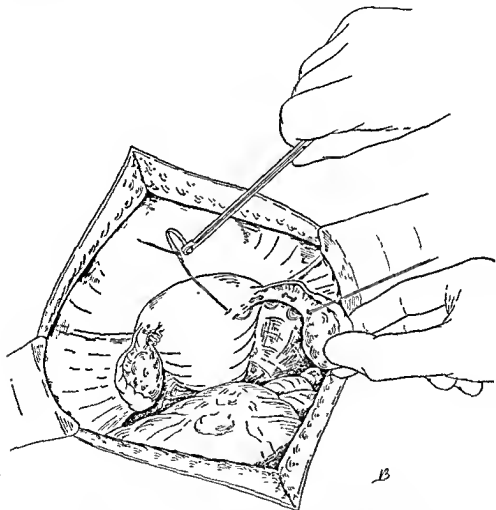


Fig. 492.—Ovarian suspension: Showing the pleating suture untied and tied.

iii. Insertion of the intra-uterine nozzle.—Auvard's speculum having been inserted into the vagina, the cervical canal is dilated so that it will just allow the intra-uterine nozzle to be inserted into the cavity of the uterus.

iv. Forcing air into the uterus.—The head end of the table is now

tilted downwards so as to raise the buttocks, and the vagina is filled with an antiseptic solution to detect whether the air which is being pumped in is escaping through the cervical canal. The surgeon then compresses the bulb of the apparatus, watching the manometer meanwhile (Fig. 493).

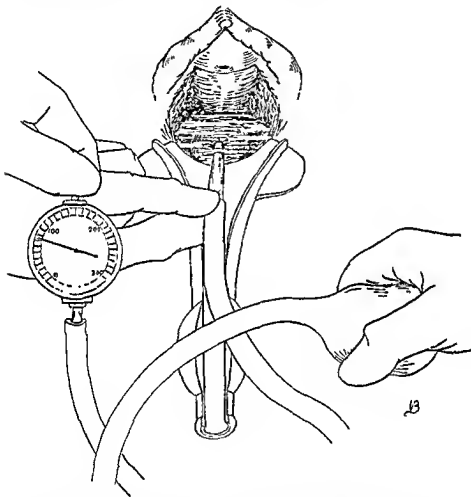


Fig. 493.—Testing the patency of the Fallopian tubes by inflation from below. The table is tilted to prevent the fluid running out of the vagina.

iv. Diagnosis of the patency of the tubes.—With normally patent tubes the hand of the surgeon compressing the bulb can feel the air passing in at a pressure of about 50 mm. On the other hand the pressure may need to be raised to 100, or even 150 mm., before this occurs, but such high pressure indicates abnormality. If even at this pressure the passage of air is not effected, the surgeon, by increasing his grip on the bulb, raises the pressure to 200 mm. If air does not pass with the manometer at this level both tubes are obstructed and the

surgeon should cease his effort in case the compressed air, being unable to pass the obstruction, should rupture the tube. It is unnecessary to empty the bulb more than once, for if this quantity of air has passed it must have gone into the peritoneal cavity unless there has been leakage, and this has been guarded against. Neither is there need to auscultate the abdomen.

Dangers and difficulties.—In our opinion this test should never be carried out except under anaesthesia and with full surgical precautions. It should never be performed on any patient in whom there is the slightest suggestion of infection. In any case of doubt the organismal content of the cervical canal and vagina should be tested bacteriologically. We acknowledge a case in which failure to take these precautions resulted in a bilateral gonorrhoeal pyosalpinx. If the air does not pass, this does not necessarily mean that the obstruction is permanent, since the closure may be due to temporary causes, such as a clot or plug of mucus. Moreover, the obstruction may be caused by a temporary spasm or it may be valvular, so that although air will not pass from below upwards it may be made to pass from above downwards (*see* p. 671). Further, the obstruction in the tubes may be due to kinks which can be relieved by moving the uterus. This point particularly applies to retroversion of the uterus, and when testing a patient in whom this malposition is present the uterus should be brought forwards by the intra-uterine nozzle to ascertain if its change of position will remedy the obstruction.

It is believed by some that tubal inflation can clear away an obstruction so as to allow a patient to have the chance of becoming pregnant. From a large experience of viewing closed tubes through an abdominal incision we are exceedingly doubtful about this.

We are of opinion that before the abdomen is opened with the object of re-opening closed tubes, they should in most cases have been tested twice at some interval, in case the obstruction found on the first occasion was merely temporary. The second testing should be carried out immediately before, and as part of, the abdominal operation.

LIPIODOL

An alternative to tubal inflation is the injection of lipiodol into the uterus and tubes. It is claimed for this method that it has the advantage over air-inflation of showing, with the help of X-rays, whether one or both tubes are blocked, or whether the obstruction is at the outer or inner ends of the tube. With respect to these points the advantage is purely theoretical, since if one tube only is blocked there is not any indication for further operative treatment, and knowledge of where the tubes are blocked will make no difference to a surgeon expert in the restoration of tubal patency, since he can overcome the obstruction whether it is at the outer or inner ends. On the other hand, the lipiodol

test is a more painful and a longer procedure, and when the lumen of the tube is very narrow the thick lipiodol may be unable to pass through it though air would. Moreover, several cases of lipiodol embolus have been reported; some which ended fatally. Death by gas-embolism after inflation by Rubin's method is also on record, but the fatalities are much fewer.

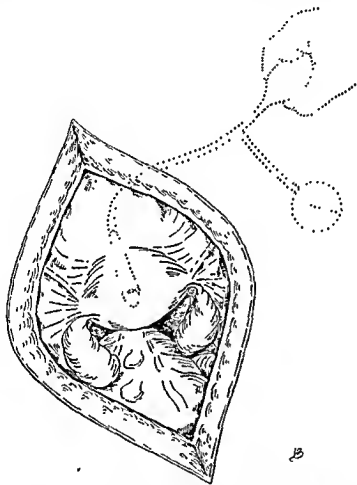


Fig. 494.—Salpingostomy: Testing the tubes by inflation from below. The tubes are distended by the air, which cannot escape.

SALPINGOSTOMY

Some cases of sterility are found to be due, on testing the patency of the Fallopian tubes, to an obstruction in some part of their lumen. If the patient wishes to have the potentiality for child-bearing restored to her, and is willing to undergo an abdominal operation for the purpose of making the tubes pervious, the surgeon is justified in performing it. The patient should, however, be made to realize that though the object of the operation may be attained, she will not necessarily become

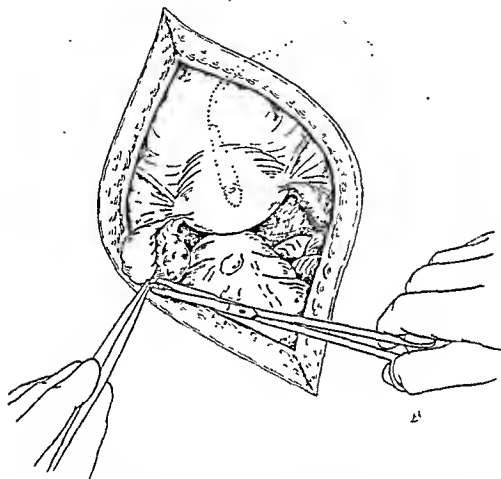


Fig. 495.—Separating the closed tube from the outer pole of the ovary.

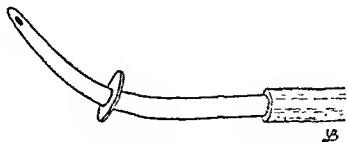


Fig. 496.—Nozzle of inflator with disc attached.

pregnant. When, on opening the abdomen, the obstruction is found to be due only to the closure of the ampullary ends of the tubes, the operation of salpingostomy is indicated.

In certain cases also of hydrosalpinx, and hæmatosalpinx not due

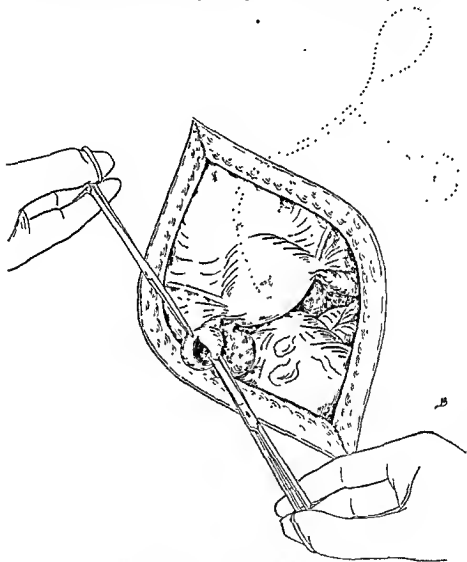


Fig. 497.—Slitting the Fallopian tube.

to tubal gestation, in which the tube-wall, though thinned by distension, is otherwise healthy, the operation of salpingostomy is indicated in preference to salpingectomy, in conjunction with tubal implantation.

Preparation of the patient.—See p. 78.

Instruments.—See pp. 20 and 274; also a myomectomy clamp.

Operation. i. Testing the tubes from below.—If the operation is being purposely carried out on account of sterility, the first step is to

test the patency of the tubes by the method of inflation described on p. 662. The tubes being found closed, the intra-uterine nozzle is retained in the uterus by packing the vagina round it with flavine gauze. In order to make the gauze packing hold the nozzle securely in the uterus, and prevent it being squeezed out by the subsequent

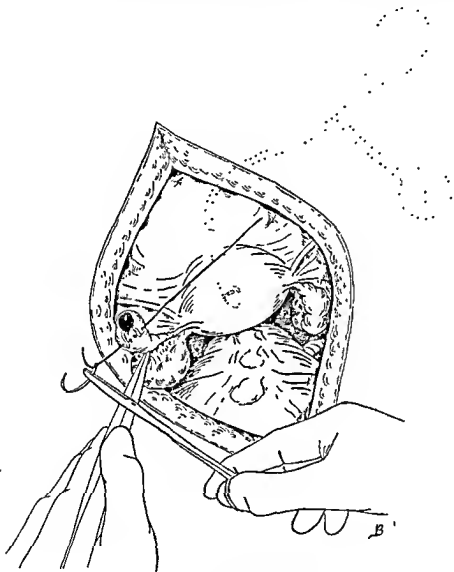


Fig. 498.—Making the cuff.

manipulations in the abdomen, we have had a disc attached to it against which the gauze is packed. (Fig. 496.)

ii. Opening the abdomen.—See p. 274.

iii. Packing off the intestines.—See p. 282.

iv. Observing the Fallopian tube.—See p. 644. An assistant now compresses the bulb of the inflation apparatus while the operator

pregnant. When, on opening the abdomen, the obstruction is found to be due only to the closure of the ampullary ends of the tubes, the operation of salpingostomy is indicated.

In certain cases also of hydrosalpinx, and hæmatosalpinx not due

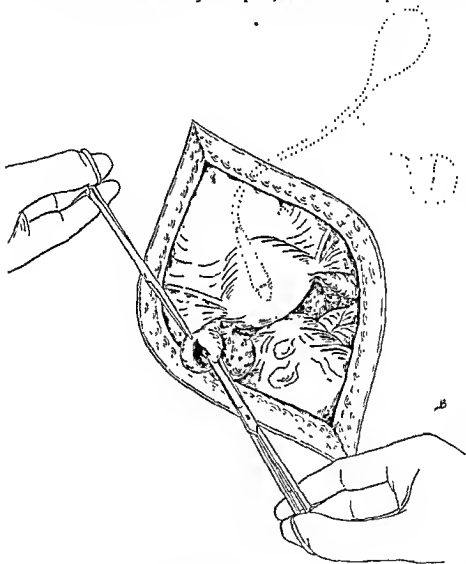


Fig. 497.—Slitting the Fallopian tube.

to tubal gestation, in which the tube-wall, though thinned by distension, is otherwise healthy, the operation of salpingostomy is indicated in preference to salpingectomy, in conjunction with tubal implantation.

Preparation of the patient.—See p. 78.

Instruments.—See pp. 20 and 274; also a myomectomy clamp.

Operation. i. **Testing the tubes from below.**—If the operation is being purposely carried out on account of sterility, the first step is to

i. Testing the patency of the Fallopian tubes.—Before opening the abdomen the intra-uterine nozzle with the disc, shown in Fig. 496, attached to the inflating apparatus, should be passed into the uterus and air squeezed through it to verify the obstruction. The obstruction

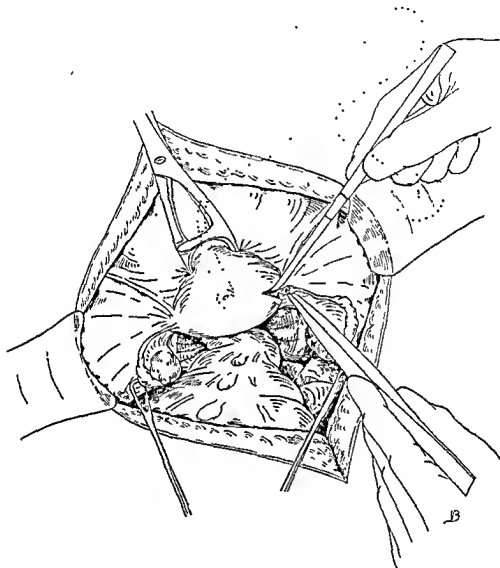


Fig. 502.—Dissecting the Fallopian tube out of the cornu.

being proved, the nozzle is held *in situ* by gauze packed into the vagina around it and up against the disc on it.

ii. Opening the abdominal cavity.—See p. 274.

iii. Inspection of the Fallopian tubes.—The tubes are now freed from any adhesions which may present themselves and are brought up and inspected. Attention must be paid to the fimbriated extremities and to the presence or otherwise of distension or nodular thickening.

iv. Retesting the patency of the Fallopian tubes from below.—The attempt to inflate the tubes from below is now repeated, the surgeon watching the tubes to see if any air enters or passes through them.

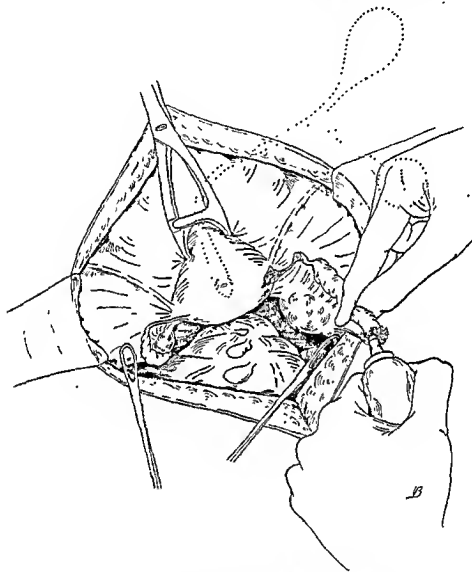


Fig. 503.—Retesting the Fallopian tube from above: Air does not pass, as indicated by the dilatation of the tube.

v. Testing the patency of the Fallopian tubes from above.—If air does not pass into the tube from below, the nozzle of the abdominal tube-inflator, described on p. 20, is now inserted into each of the external ostia in turn if they be patent, or—if they were not patent—after salpingostomy has been performed (*see* p. 671). In some cases, though

air cannot be forced into the tubes from below, it can be made to pass if blown in from above, probably because the occlusion at the inner ostium is valve-like.

While performing this part of the operation the surgeon should watch the manometer attached to the inflation apparatus. If the smallest

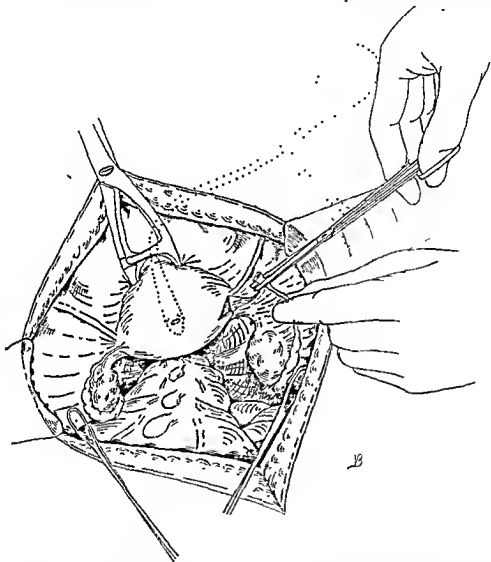


Fig. 504.—Cutting away a portion of the inner end of the Fallopian tube.

amount of air can be forced into the uterus the manometer will rise. If the air passes freely downwards it can be heard to pass into the uterus with a characteristic gurgle (Fig. 501).

vi. *Dissecting out the interstitial portion of the Fallopian tube.*—If air cannot be made to pass either way, the interstitial portion of the tube is closed. A pair of ring forceps having been applied on either side to the ovario-pelvic ligament and the myomectomy clamp round

the cervix so as to render the operation bloodless, the interstitial portion is dissected out of the cornu (Fig. 502).

vii. Retesting the patency of the Fallopian tubes.—The interstitial portion of the tube having been freed, the abdominal tube-inflator is

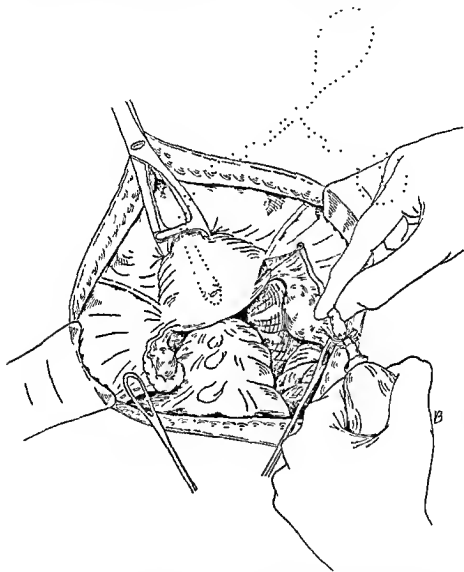


Fig. 505.—Retesting the Fallopian tube from above: Air passes through it.

again passed into the outer ostium and pressure on the bulb is applied. If air does not pass, the obstruction at the inner end of the tube still remains, and the surgeon will notice the tube expanding under the pressure (Fig. 503).

viii. Removal of the obstructed portion of the Fallopian tube.—A small piece of the resected end of the tube is now snipped off with the scissors (Fig. 504) and the patency once again tested (Fig. 505). If the obstruction has been removed, the air will be seen to bubble or heard to hiss through the resected end. A drop of sterile water applied to the

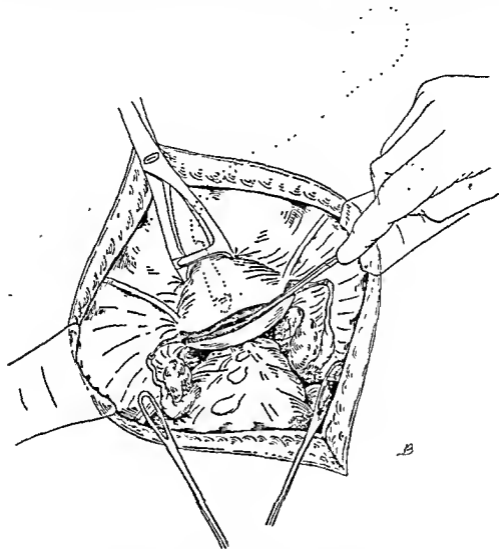


Fig. 506.—Incising the fundus of the uterus.

resected end is helpful. If the air does not pass, another small portion is cut off and the test made again, and so on until the air passes. The surgeon now has at his disposal a patent length of tube.

ix. Preparation of the other Fallopian tube.—The same procedure is carried out on the opposite side.

x. Transverse incision through the fundus of the uterus.—The fundus is now split transversely from cornu to cornu until the cavity of the uterus is opened (Fig. 506).

xi. Passing gut down the tubes.—A 40-inch strand of nylon gut is now threaded along each tube from the inner opening to the outer ostium. To do this easily a magnifying lens is required. A forceps is then attached to the strand where it protrudes from the external ostium.

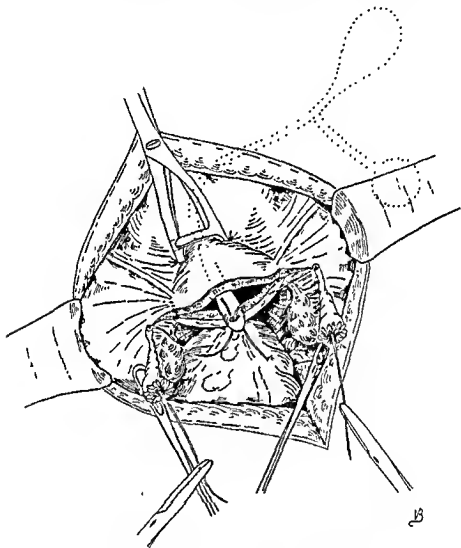


Fig 507.—Drawing down the strands of gut threaded through the Fallopian tubes.

xii. Drawing the gut into the vagina.—The hollow dilator in the uterus is now pushed through the incision in the fundus, the myomectomy clamp being released for the moment if necessary, and the lower ends of the two strands are then threaded through the holes

in the nozzle as far as they will go. The nozzle is now withdrawn into the vagina bringing with it the two strands, the surgeon meanwhile holding the forceps on the upper ends of the strands (Fig. 507).

An alternative is to cut the strand of gut $\frac{1}{2}$ inch beyond either ostium and leave it *in situ* in the tube. We find that it is expelled from the uterus in 2 or 3 weeks, presumably by peristalsis of the tube.

xiii. Fixing the ends of the Fallopian tubes into the uterus.—The tube ends are laid into the incision in the uterus and are fixed there by

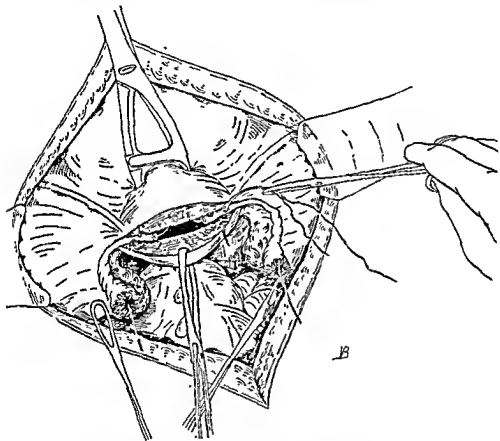


Fig. 508.—Fixing the Fallopian tubes in the uterus.

interrupted sutures of fine silk passing through the muscular coat of the tubes and a portion of the uterine wall. The operator must be careful that the amputated ends of the tubes project freely into the cavity of the uterus (Fig. 508).

xiv. Suture of the uterine incision.—The edges of the fundal incision are now united with an interrupted catgut suture (Fig. 509).

xv. Cornual fixation of the Fallopian tubes.—Interrupted sutures of fine silk are now inserted through the cornual incision and muscle of

the tube on each side and, being tied, are an additional safeguard to the fixation of the tubes (Fig. 510).

xvi. Removing the ring forceps and myomectomy clamp.—Lastly,

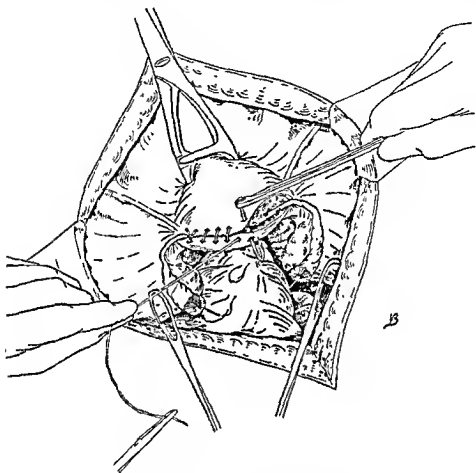


Fig. 509.—Suture of the uterine incision.

these instruments are removed and any oozing of blood is arrested, when necessary, by additional sutures in the uterine incision.

xvii. Closing the abdominal wound.—See p. 286.

xviii. The gut in the vagina.—If gut has been inserted into the tubes and pulled into the vagina, the ends are sought and placed in a position favourable for removal.

Dressing and after-treatment.—See p. 24 and Chapter xxx.

Difficulties.—The difficulty of the operation depends on the state of the tubes and the tissues adjacent to them. When there is much

thickening of the cellular tissue at the top of the broad ligament, it may be difficult to mobilize the tubes sufficiently freely to bring them into the uterus. The myomectomy clamp, in these cases, should not be applied over the round ligaments (*see* p. 424), because this procedure restricts the mobility of the tube. The strands of gut should be removed,

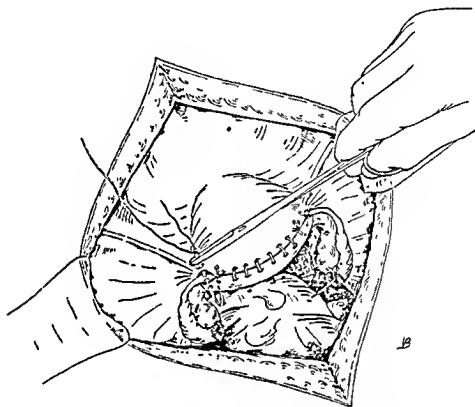


Fig. 510.—Final suture fixing the Fallopian tube to the uterus.

via the vagina, in about 10 days. It may be impossible to thread anything through the tubes and in this case the step may be omitted, or instead a piece of fine silk may be passed into the open isthmic end as far as it will go, as described on p. 684.

Alternative technique.—As an alternative to the operation just described the following technique has the advantage of being simpler and quicker, but it has the drawback that the union of the inner ends of the tubes with the cavity of the uterus is less accurate. The steps are:—

i. **Removing the obstructions.**—The steps whereby the obstructions at the inner ends of the tubes are removed and a length of patent tube on each side procured are the same as those described on p. 674 and illustrated by Figs. 501–505. The operation then proceeds as follows.

ii. **Withdrawing the intra-uterine inflator.**—If an insufflator has been employed in the manner described on p. 668 it must be withdrawn.

iii. **Incising the front of the uterus.**—An incision is made through the front of the uterus in the middle line ; this opens the cavity.

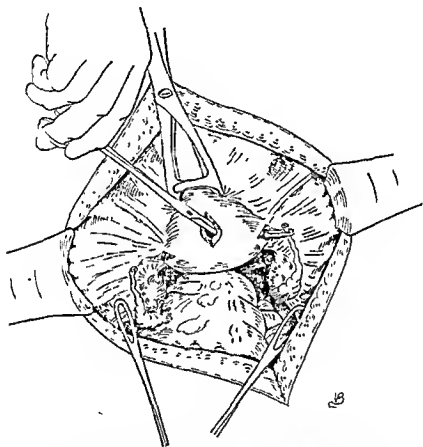


Fig. 511.—Alternative technique of tubal implantation : Seizing the end of the tube by the round ligament forceps through the cornu.

iv. **Passing the round-ligament forceps.**—A round-ligament forceps is passed into the uterine cavity through the incision just made and forced through the wall of the uterus at its cornu (Fig. 511).*

v. **Grasping the end of the tube.**—The blades of the forceps are opened and made to seize the end of the tube.

vi. **Pulling the tube into the uterus.**—The forceps is withdrawn, dragging the tube after it into the uterus.

* A better instrument is a nasal polypus forceps, with short jaws, as it does not stretch the perforation when being opened.

vii. *Fixing the tube.*—Traction being maintained on the forceps, the tube is fixed to the peritoneum covering the cornu by three fine silk sutures so that it cannot slip back (Fig. 512).

viii. *Cutting off the portion of the tube grasped by the forceps.*—The end of the tube is divided just beyond the point where the forceps grips it (Fig. 513).

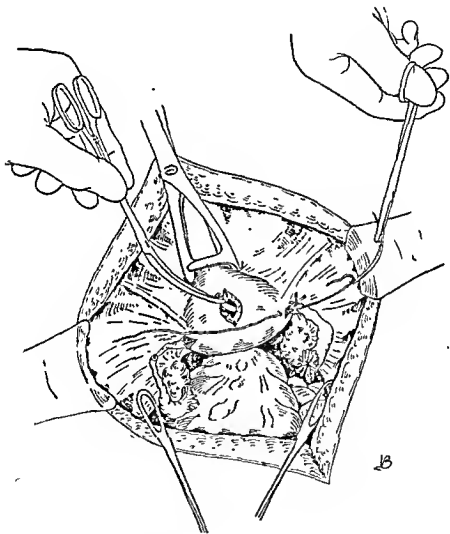


Fig. 512.—Fixing the tube to the cornu.

ix. *Treatment of the tube on the opposite side.*—The same steps are performed on the tube on the other side.

x. *Suture of the uterus.*—The incision in the uterus is closed by interrupted catgut sutures.

xi. Suture of the abdominal wound.—See p. 286.

Alternative method of threading the tubes.—It is sometimes impossible to thread gut throughout the length of the tubes in the manner described on p. 678. Since the object of the threading is to keep patent the new communications between the tubes and the uterus, which otherwise are in danger of scarring up and becoming occluded by ad-

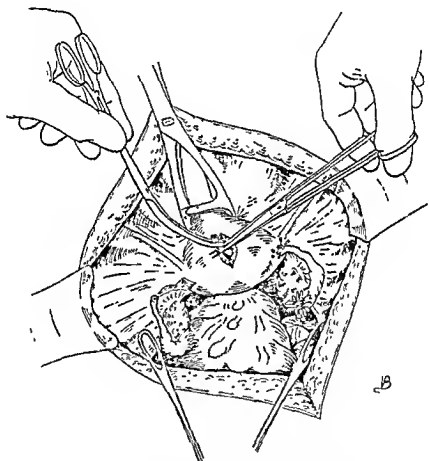


Fig. 513.—Cutting off the inner end of the tube.

hesions, the following method, though not so good as that previously described, is always feasible.

A straight Souttar's needle to which is attached a strand of fine silk is taken and its sharp end broken off. Thus blunted, it is passed into the lumen of the tube, exposed where the tube has been divided and, having been passed up the tube as far as it will go freely, is then forced through the wall and withdrawn, leaving a portion of the silk strand

hanging out of the lumen while another portion emerges on the peritoneal surface of the tube. The tube is then implanted and the silk left to absorb or become freed (Fig. 514).

PARTIAL SALPINGECTOMY FOR STERILIZATION

Of the occasions when sterilization may be called for we need mention here three only, namely Cæsarean section, abdominal evacuation before viability, and certain cases of prolapse.

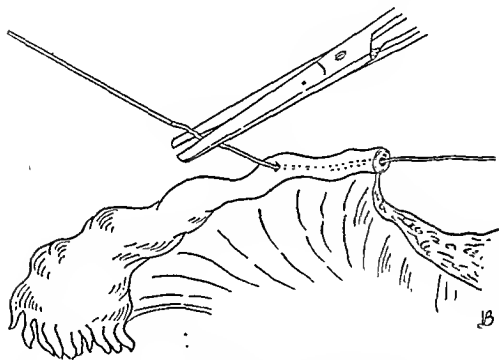


Fig. 514.—Method of passing a strand of fine silk through the inner end of the tube.

Operation. i. *Ligature of the Fallopian tubes.*—Each tube is raised by two pairs of forceps and a silk ligature is passed round the tube and mesosalpinx, underneath the forceps, and tied (Fig. 515).

ii. *Amputation of the ampullæ.*—Those portions of the tube and mesosalpinx distal to the encircling ligatures are then amputated with a pair of scissors, care being taken not to cut the tubes too close to the ligatures (Fig. 516).

Difficulties and dangers.—Silk only must be used since, on absorption of catgut ligatures, the end of the tubes might re-open and the patient again become pregnant. In addition, if a sufficient button of tissue is

not left distal to the ligature, the latter may slip and secondary hæmorrhage result. Even when silk is used for the ligature there is a possibility that the tubes may subsequently re-open, the ligature

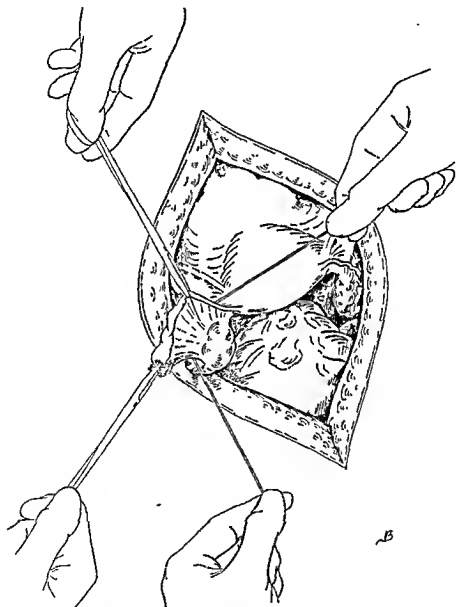


Fig. 515.—Partial salpingectomy to effect sterility:
Ligaturing the Fallopian tube.

in this case cutting through the tube before scar tissue has had time to form and block the lumen. The chance of this happening is, however, extremely small.

Instead of the operation described, total salpingectomy may be performed (*see p. 660*), but even after this procedure pregnancy has occurred, according to Rivett and Lochrane, Lewis Rivett now excises

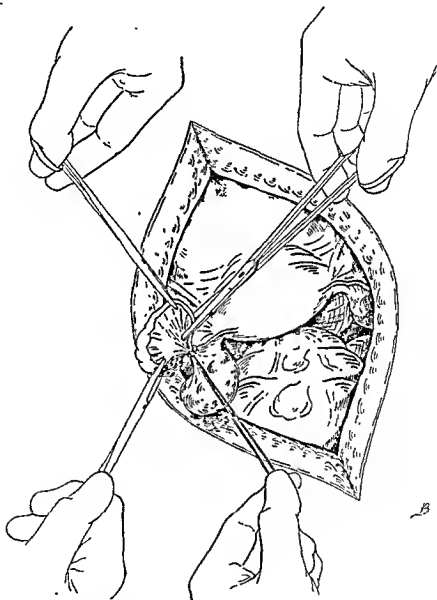


Fig. 516.—Cutting away the outer end of the Fallopian tube.

a wedge from the top of the uterus which includes both tubes (Fundectomy). Both these are, however, much more severe operations and, in our opinion, the increased risk involved more than counterbalances the lessened chance of failure.

BURYING THE FIMBRIATED EXTREMITIES OF THE FALLOPIAN TUBE

Instead of excising the Fallopian tubes, or part of them, their fimbriated extremities may be buried in the broad ligaments. This operation has the advantage that it would be possible to restore the continuity of the Fallopian tube at some later date, in the event of the patient wishing to become pregnant.

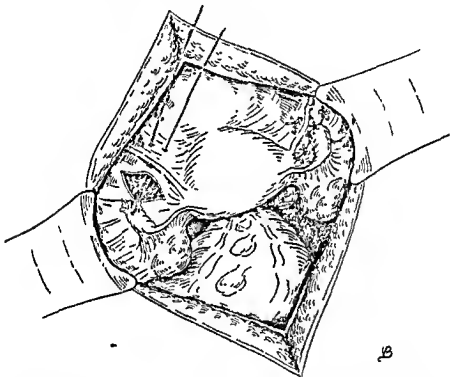


Fig. 517.—Burying the outer end of the Fallopian tubes to effect reparable sterility: The sutures untied on one side and tied on the other.

i. Making an opening in the broad ligaments.—The peritoneum of the broad ligament on each side, is picked up and divided between the round ligament and ovario-pelvic ligament, rather nearer to the former. With the point of a pair of blunt scissors the cellular tissue is pushed aside until a cavity is formed.

ii. Burying the end of the tubes.—A silk suture, No. 2, is now passed through the muscular wall of the tube on its ante-mesosalpingeal border. Each end of the suture is then passed through the hole in the broad ligament and made to emerge on the front of the broad ligament, a little below the round ligament. This suture being tied, the end of

the tube is pulled into the cavity prepared for it. A fine silk continuous suture is now used to bring the edges of the cut peritoneum together, picking up as it does so the peritoneum of the tube (Fig. 517).

On occasions the mesosalpinx is so short that the tube is not readily turned forwards. This difficulty is to be overcome by dividing the outer edge of the mesosalpinx.

CHAPTER XXV

OPERATIONS FOR EXTRA-UTERINE GESTATION

THE operative treatment of extra-uterine gestation depends upon the period of pregnancy.

FIRST THREE MONTHS

The operations that may be indicated in the first three months are salpingectomy, oöphorectomy, salpingo-oöphorectomy, hysterio-salpingectomy, salpingectomy with partial hysterectomy, and salpingostomy.

It is desirable to save the ovary if possible, and this can usually be accomplished in cases of acute tubal rupture, and especially when the pregnancy is very early. When, however, the distension of the tube is very great, the ovary may be so adherent or disintegrated that its removal together with the Fallopian tube becomes necessary.

In ovarian pregnancy the same holds good, but a part of the ovary alone may be removed in early cases of acute rupture. The operative technique in such cases is similar to that already described under Salpingectomy (p. 643), Salpingo-oöphorectomy (p. 649), and Oöphorectomy (ovariotomy) (p. 622).

In certain cases of tubal gestation it is possible to remove the pregnancy from the Fallopian tube without removing the latter. This should always be attempted in the case of young women anxious to have children.

Acute rupture of the gestation-sac with hæmoperitoneum.—There is no class of case in which the symptoms supervene with more dramatic suddenness and intensity than in acute tubal rupture, nor any in which prompt and determined surgical measures are rewarded with more pleasurable success.

The primary object of controlling the bleeding tube should be carried out as quickly as possible. This effected, the surgeon may proceed with the rest of the operation with such deliberation as the state of the patient admits.

Directly the abdominal muscles are separated, the peritoneum will be seen to have a bluish tinge, due to the blood beneath it. The abdomen being opened, time should not be wasted in clearing out the effused blood, but the hand should be passed down to the uterus, and with this as a guide, the ruptured tube is discovered, grasped, pulled out of the wound, and clamped. The appendage is now examined, and

the whole of it, if diseased, or the Fallopian tube or the ovary only if conservation be possible, is removed. The opposite Fallopian tube having been examined and found healthy, the effused blood in the pelvis is rapidly cleared out, and swabs on forceps are passed up into the loin pouches to remove any accumulation of blood which has settled there. When, however, the patient's condition is very bad, it

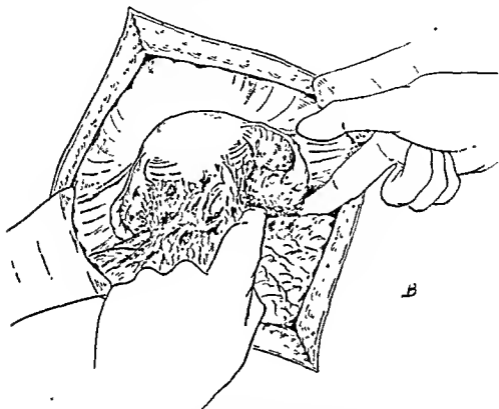


Fig. 518.—Operation for tubal gestation with hæmatocele: Separating the Fallopian tube.

is a mistake to waste time in trying to remove all the blood, as this involves much handling of the intestines. In such cases, while the surgeon is securing the bleeding-point, an assistant exposes the median cephalic or basilic vein, and directly the hæmorrhage is under control he starts saline, blood, or plasma infusion.

Rupture of the gestation-sac with hæmatocele.—In these cases the omentum will be found adherent to the fundus of the uterus and to the appendage on the diseased side. The collection of black blood-clot forming the hæmatocele is exposed and scooped out with the left hand. It will be found that the hæmatosalpinx is buried in this blood-clot at the bottom of the pelvis, from which it is displaced. The appendage, being raised, is dealt with by complete removal or by

salpingectomy (pp. 643 and 660), or by removing the gestation and conserving the Fallopian tube (Figs. 518, 519 and 520).

The opposite tube is next examined. It will frequently be found to be in a condition of hydrosalpinx or hæmatosalpinx. If so, it should be opened, emptied, and salpingostomy carried out (p. 694).

Not seldom, from the bed of the separated Fallopian tube there will be troublesome oozing, which can generally be arrested with hot swabs.

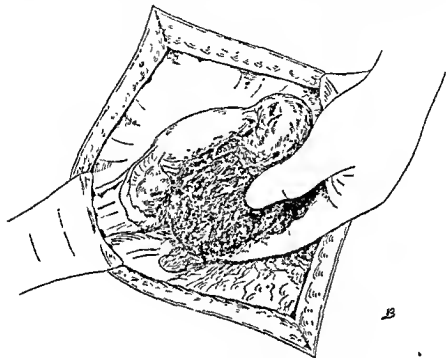


Fig. 519.—Removing the blood-clot from the pelvis.

The question of drainage depends mostly on the previous temperature of the patient. If the latter has been considerable, and irregular in type, suggesting septic infection, a drainage-tube should certainly be inserted; in other cases this is not necessary.

Rupture of the gestation-sac with a broad-ligament hæmatoma.—The treatment of this class of case is conducted on lines similar to those described under hæmatocele, the only difference being in the treatment of the sac left after the evacuation of the hæmatoma. When the effused blood is limited to the mesosalpinx, it is generally possible to remove it *en masse* with the tube. If, however, it has extended into the broad ligament proper and if, as in bad cases, it has also lifted the peritoneum off the lateral pelvic wall and iliac fossa and on the left side made its way into the mesentery of the colon, it may be best, having removed the tube and evacuated the blood from the sac in

the broad ligament, to stitch the opening in the sac to the parietal wound, and drain it with a tube for a few days. In very bad cases, especially when there is difficulty in controlling the bleeding from the wall of the sac, the uterus and upper part of the broad ligament may

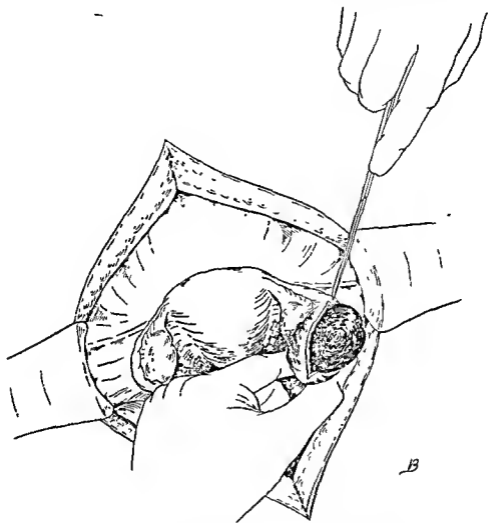


Fig. 520.—Conservative treatment of a pregnant Fallopian tube.
Removing the mole.

be removed, and the anterior peritoneal flap thus obtained used to cover over the raw surface or base of the sac.

Ruptured interstitial gestation.—Hysterectomy, or partial hysterosalpingectomy, is indicated in the rare condition of ruptured interstitial gestation. In most of the recorded cases the former operation has been performed. An alternative procedure is to remove the wedge-shaped portion of the uterine tissue containing the gestation-sac alone,

We have performed this operation with success. Its merit lies in the conservation of the uterus.

CONSERVATION OF THE FALLOPIAN TUBE

In those cases in which the pregnancy in the Fallopian tube is small and the condition of the patient good, and the tube, though

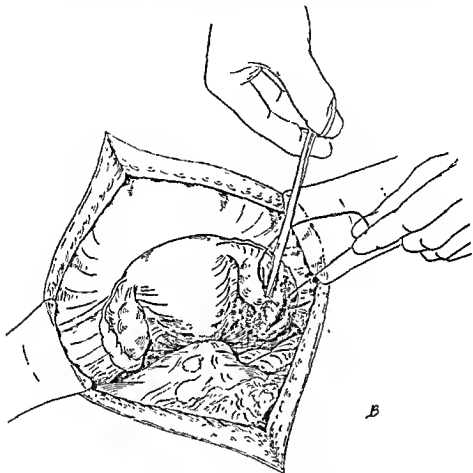


Fig. 521.—Suturing the Fallopian tube.

stretched, not severely damaged, the pregnancy alone may be removed and the tube conserved.

Operation.—The Fallopian tube having been separated in the manner already described, a longitudinal incision is made through its wall down to the gestation which it encloses. In most of the cases suitable for this operation the tube contains a blood mole (Fig. 520).

The mole is removed by pressure, aided, perhaps, by the handle of a scalpel, and, all bleeding-points having been secured, the incision in the tube-wall is closed by a series of No. 1 interrupted sutures (Fig. 521).

Care must be taken not to constrict or close the lumen of the tube. It not infrequently happens that the abdominal ostium is found to be closed or nearly closed as the result of the pregnancy. If this is found to be the case, the incision made to extract the pregnancy should be left open to form a new abdominal ostium (*see* page 666).

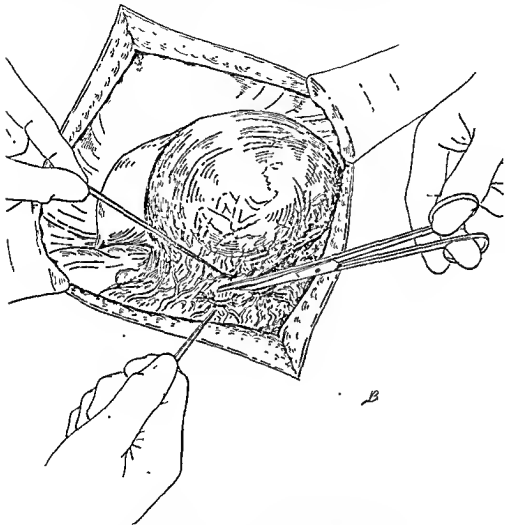


Fig. 522.—Operation for advanced extra-uterine gestation: Tying off the vessels in the adherent omentum.

FOURTH, FIFTH AND SIXTH MONTHS

As, after the 3rd month, the gestation can no longer be confined in the Fallopian tube, but is either intraperitoneal or intraligamentous, and as with the advance of pregnancy the placental surface becomes increasingly large, and the vascularity of the parts increasingly greater, these cases present features peculiar to themselves. It is a fact that, having passed the limit of the 3rd month safely, the gestation sometimes proceeds to term without further trouble, but at other times

the operator will be called upon to interfere because some acute symptoms have arisen. In these cases the whole crux of the situation is the treatment of the placenta. If the child is dead, the placenta can in most cases be removed without serious risk. If the child is alive, the position of the placenta requires consideration. If the sac is intraperitoneal, the placenta is most commonly adherent to the back and fundus of the uterus, the affected tube, the back of the broad ligament, and the omentum—positions in which it is possible to control the vessels before attempting its removal. In other cases, however,

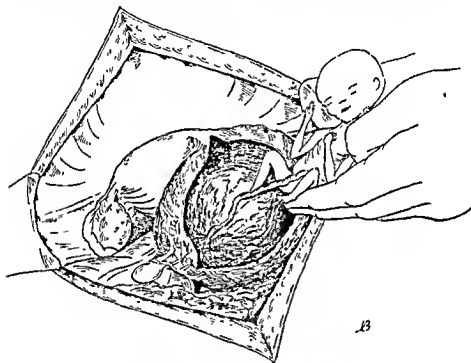


Fig. 523.—Removing the fœtus.

the placenta is adherent to the intestine or the iliac fossa, in which event it is not possible to follow this procedure. If the sac is intraligamentous the case is more serious still, for in this situation nearly the whole of the chorion is placental, and it may be impossible to remove the child without incising the placenta, while the vessels cannot be controlled beforehand.

On opening the abdomen, therefore, the operator should very carefully study the problem that lies before him, and avoid the premature separation of any adhesions before he has settled upon his plan of action.

GESTATION-SAC INTRAPERITONEAL

If the gestation-sac is intraperitoneal, it is better in all cases to attempt its complete extirpation.

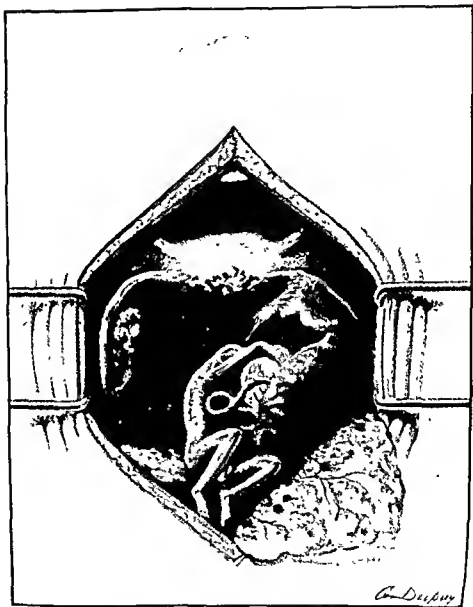


PLATE XVII —Ruptured Tubal Pregnancy

Operation. i. Opening the abdominal cavity.—See p. 274.

ii. Separating the adherent omentum.—As many tributary vessels as possible in the omentum should be ligatured. The separation is carried out in stages, small pieces of the omentum being ligatured and then

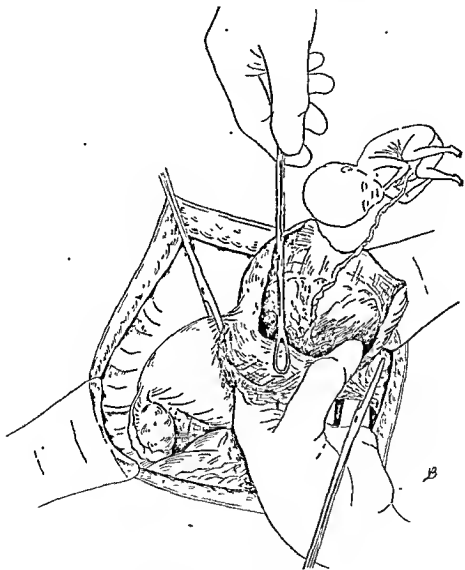


Fig. 524.—Removing the gestation sac.

divided with scissors, and so on till the gestation-sac is free (Fig. 522). The separation of other adhesions under the sac may be required before the sac is free.

iii. Removing the foetus.—An incision is now made in the gestation-sac and the foetus is removed, leaving the placenta *in situ* (Fig. 523).

iv. Removing the gestation-sac.—A pair of pressure forceps having been applied to the upper part of the broad ligament, another to the cornu of the uterus, and a pair of ring forceps to one edge of the sac, the fingers of the left hand are placed under the sac, which is raised with the help of traction on the ring forceps. The sac is then removed by cutting its attachment to the upper part of the broad ligament and cornu of the uterus (Fig. 524).

v. Ligature of the upper part of the broad ligament and of the uterine cornu.—See p. 649.

vi. Drainage.—See p. 49.

vii. Closing the abdominal wound.—See p. 286.

GESTATION-SAC EXTRA-PERITONEAL

If the sac is intraligamentous, the course to be pursued is more difficult of decision. When the gestation has not advanced beyond the 4th month, or in any case in which the sac is so situated that its entire removal appears feasible, it is best to do this. The hæmorrhage, which is bound to be free, may be minimized by removing the uterus as well, beginning the operation on the side opposite to the gestation-sac, and securing the uterine artery on the same side as the supravaginal cervix is cut across, and before the extirpation of the sac.

When, however, the sac is deeply imbedded between the layers of the broad ligament, it may be safer to open the sac and membranes, and remove the child, and either stitch the sac to the abdominal wound (marsupialization) or deliberately sequester the placenta by stitching up the sac.

The *rationale* of sequestration of the placenta is founded on the good results obtained by nature in cases of spontaneously sequestered extra-uterine gestation. It goes without saying that the operation must be conducted with the greatest care for asepsis.

Sometimes it is impossible to incise the intraligamentous sac without cutting through the placenta. In such an event sequestration may still be proceeded with if the bleeding from the cut edges of the placenta can be arrested by sutures. When it cannot, or when part of the placenta is definitely separated, it will be necessary at all costs to extirpate it in the manner described above.

SEVENTH, EIGHTH, AND NINTH MONTHS, AND AFTER TERM

The whole question of the operative treatment of advanced extra-uterine gestation is beset with great difficulties, the more so since these cases are so rare that no individual operator has had sufficient experience to enable him to generalize, while the conditions found are so different in their anatomy that no two cases are alike.

The treatment formerly recommended, namely, that of postponing operative interference until the child has been dead for some time, in the hope that the placenta can then be removed with safety, appears, in the light of an exhaustive analysis by Gordon Ley of 100 cases of advanced extra-uterine gestation, to be wrong.

Ley showed that the best results are obtained by operating at once, since it is impossible to determine when the maternal circulation in the placenta will have become arrested, and quite as furious hæmorrhage has been encountered, on separating the placenta, weeks after the death of the child, as when attempting the same after delivery of a living child.

Against the possible risk of hæmorrhage is the almost certain risk of sepsis if the patient is left for any length of time without operative treatment after the death of the child. Moreover, in these cases the results to the mother of delayed operation are shown to be worse than those of immediate operation.

It is difficult to lay down any rules for the treatment of the placenta. From a review of Ley's cases the safest course to follow appears to be to ligature as many as possible of the main vessels running to the sac, and then to remove the placenta, and a study of the many cases reported since his time confirms this opinion. If it is impossible to remove the placenta, it had better be sequestered in the manner already described.

CHAPTER XXVI

TUMOURS COMPLICATING PREGNANCY, LABOUR, AND THE PUERPERIUM

OVARIAN TUMOUR AND PREGNANCY

THE well-recognized rule that if a woman has an ovarian tumour the sooner it is removed the better it will be for her, holds good with but few exceptions, be she pregnant, in labour, or lying-in. An ovarian tumour is more liable to rupture, inflammation, axial rotation, or bleeding when any of the above-named conditions are present than in their absence.

The tumour, because of the greater blood-supply, will grow more rapidly, and on this account the resulting pressure may cause troublesome vomiting or serious œdema. Again, the patient is more likely to miscarry on account of the presence of the tumour, and the tumour itself is particularly likely to undergo axial rotation. When, in addition, it is remembered that the patient has to go through the ordeal of labour, it is evident that the tumour should be removed with the least possible delay. As a rule, the results of removal are particularly gratifying, the pregnancy in the majority of cases continuing to term without further trouble. It must be remembered, however, that the risk of miscarriage after the enucleation of a broad-ligament cyst is greater than after a simple ovarian cystectomy or ovariectomy.

Of these two operations, the former is always to be preferred, as the patient is relatively or actually young. Ovarian cystectomy is specially indicated when the tumours are bilateral, for it is evident that, in spite of them, one at least of the ovaries is functioning. One of us (V.B.) has enucleated as many as 6 dermoid cysts during pregnancy, 3 from one ovary and 3 from the other, the patient being delivered at term and subsequently bearing two further children.

Great care must be exercised, when removing an ovarian tumour complicating early pregnancy, not to injure the uterus. If the uterus is injured it may be necessary to open it and remove the ovum after the manner of a Cæsarean section (*see* p. 488), or if the wound is slight its suture may suffice.

There are 4 exceptions to the rule that the removal should be immediate: (1) When a small cyst, well out of the pelvis and freely movable, is discovered at the end of pregnancy, in which event it may be allowed to remain till the puerperium is well established, provided

that the patient can be kept under observation, and treatment adopted at once if urgently menacing symptoms arise; (2) When the patient is a primigravida and within a few years of the menopause. In such a case removal of the tumour may result in a miscarriage and the chance of the patient again becoming pregnant is small. In this event the operation should be delayed, if possible, at any rate until the 36th week; (3) When an ovarian cyst is associated with a vesicular mole, since such a tumour consists probably of multiple lutein cysts which have been shown to disappear after the expulsion or removal of the mole; (4) When the patient is very ill, perhaps with œdema of the lungs from the over-distension, in which case the pressure may be temporarily relieved by tapping the cyst, and its removal undertaken later.

While, as has been said, the performance of ovarian cystectomy or ovariectomy on a pregnant woman does not, as a rule, induce miscarriage or premature labour, yet a liability to this is present more or less always. For this reason it is our practice, in such cases, to administer morphia ($\frac{1}{4}$ gr.) hypodermically before recovery from the anæsthetic, and by repeated small doses, to keep the patient under the influence of this drug for 48 hours. Further, the surgeon has to remember the tension that will be thrown upon the scar if the pregnancy proceeds, and the strain upon the stitches closing the wound if labour comes on before it has united strongly. For these reasons special care must be taken to suture the wound as strongly as possible, and the ordinary three-tier method should therefore be supplemented by through-and-through sutures of silk or silkworm-gut. In the past it has been a matter of debate whether or not a child, that has attained to viability by the time the operation is performed, should be delivered by Cæsarean section at the same time or be left *in situ* until normal labour comes on. The risk of Cæsarean section when carried out by a surgeon accustomed to it being, nowadays, so small we believe that when such a one is available it is better to carry out the delivery and the ovarian cystectomy or ovariectomy at the same operation.

Difficulty.—It sometimes happens that when the abdomen is opened the tumour is found to be so wedged below the uterus that it cannot be dislodged without eventrating the uterus, and it may be found absolutely necessary to deliver the child by Cæsarean section before the tumour can be removed. Before proceeding to do this, however, an attempt should be made to dislodge the tumour by pushing it up from below, an assistant passing his hand into the vagina for this purpose.

OVARIAN TUMOUR AND LABOUR

The accidents which may occur when an ovarian tumour complicates labour depend upon the position of the tumour, as also in some respects does the treatment.

If the tumour is above the presenting part, it may rupture, its pedicle may become twisted, or it may be injured so that later it inflames.

If the tumour is below the presenting part, it will obstruct labour leading to perhaps rupture of the uterus, of the vagina, or of the rectum. On occasions the tumour itself ruptures, or is so bruised during delivery that it subsequently inflames.

Lastly, after the passage of the child the sudden elevation of the tumour may result in torsion of its pedicle.

Treatment.—When the tumour is above the presenting part obstruction is rare, and labour may be allowed to terminate, the growth being removed as soon as the patient is convalescent, or before if any untoward symptoms arise.

When the tumour is below the presenting part obstruction will result. This is usually absolute, but occasionally the uterine contractions may eventually rupture the cyst and allow the child to escape. Very rarely the tumour has been forced down by the advancing child and expelled, through a ruptured rectum or vagina, *via* the anus or the vulva.

As a permanent obstruction would lead to the death of the patient, with one exception the proper treatment is to remove it through the abdomen. After removal of the tumour, the child should be delivered by Cæsarean section, and the patient spared further suffering.

The single exception is when the attendant is not skilled in abdominal surgery and cannot obtain the services of one who is. In that case, the tumour will have to be pushed out of the pelvis under an anæsthetic, or, if this cannot be effected, incised, the contents evacuated, *per vaginam*, and the child delivered by the forceps or by craniotomy. The latter treatment entails the risk of peritonitis from escape of some of the cyst-fluid into the pelvic cavity while, if the cyst has been pushed up, the cyst-wall may subsequently slough from bruising during delivery, or the cyst may undergo axial rotation. It is therefore advisable, if the attendant has been forced to incise the cyst, that the tumour should be removed as soon as possible after the termination of labour.

OVARIAN TUMOUR AND THE PUERPERIUM

The tumour may inflame from the bruising it has received during the birth of the child or from extension of intra-uterine sepsis, and its pedicle is especially liable to torsion owing to the laxity of the abdominal wall and the mobility of the abdominal contents.

Treatment.—As a rule, if the patient has gone through labour safely, there is no necessity to interfere with the tumour until she is convalescent, but if, during the lying-in, any of the above complications

arise, the tumour must be removed as soon as possible, either by ovarian cystectomy or by ovariectomy.

Solid tumours.—The foregoing remarks deal with solid and cystic tumours of the ovary as a whole, but it is evident that those which are especially concerned with rupture and tapping have not to be considered if the tumour is a solid one.

MYOMA AND PREGNANCY

The fact that a myomatous uterus has become pregnant is, considered by itself, a contra-indication for the immediate removal of the tumour, because (1) the life of the child has to be considered; (2) the operation may involve the removal of a functional organ, though in the hands of an expert surgeon this is very unlikely; and (3) the commonest reason for the removal of myomata, namely hæmorrhage, is absent. Myomata in pregnancy should therefore only be operated on before term, if they are large, or if they are giving rise to symptoms caused by degeneration, torsion or pressure. If the tumour is so situated that obstruction to delivery is certain or likely, an operation should be performed just before term, or immediately (myomectomy if possible) if the tumour be so large as to jeopardise the pregnancy.

There is one form of degeneration of a myoma, namely, red necrobiosis, which is frequently associated with pregnancy. In this condition the tumour becomes very tender and painful, the temperature rises, and there is distinct enlargement of the growth.

Torsion of a myoma is uncommon. It occurs more often in connexion with pregnancy or puerpery than at any other time, because of the softness of the uterine tissue. The twist usually affects the pedicle only, but exceptionally the whole uterus may be rotated.

A myoma, particularly of the posterior wall, may retrovert the pregnant uterus and incarcerate it in the pelvis. A pedunculated myoma may also fall into the pelvis and become impacted, while the hypertrophy of the muscle-tissue surrounding a cervical myoma may so enlarge the mass as to cause dangerous pressure symptoms.

Lastly, although the tumour may be situated above the pelvic brim, its size, together with that of the gravid uterus, may be sufficient to produce so much abdominal distension that relief becomes urgent. Moreover, without causing actual obstruction, a large fibroid may so alter the course of labour by malpresentation, inefficient uterine action or premature rupture of the membranes as to make it very difficult, and if the uterus becomes septic after delivery the fibroid will certainly become gangrenous.

It is well known that a myoma situated by the side of, or even below, the head may during labour be displaced upwards by the retracting uterine muscle, so that the delivery is terminated in safety, but we

are of opinion that it is very unwise to await this event, for, even though it happen, the tumour may be so bruised in the process that septic necrosis will subsequently occur. If, then, at term the tumour is in the pelvis, operative treatment must be undertaken.

Treatment. i. Degeneration.—Slight tenderness and pain over a fibroid during pregnancy may spontaneously subside, but if urgent symptoms of degeneration appear, the abdominal cavity must be opened. If the child is not viable, and it appears possible to enucleate or ligature off the tumour without interfering with the pregnancy, this should be done. We have removed as many as 9 fibroids in this way, successfully. If, however, interference with the pregnancy is unavoidable, either on account of the large number of tumours present or because they are so situated that it is impossible to get at them until the uterus is emptied, the surgeon may either remove the uterus or, after delivering the pregnancy through an incision into the uterine cavity, proceed to enucleate the tumour or tumours and repair the organ in the manner described at p. 421.

If the child, on the other hand, is viable, the surgeon should in all cases proceed to remove it by Cæsarean section and then enucleate the tumour or remove the uterus.

In choosing between enucleation and hysterectomy, it should be borne in mind that a uterus which has proved its capability of carrying a child is one of which the conservation is particularly to be desired. Moreover, the forms of degeneration commonly met with (red degeneration especially) have been proved by us not to be infected, so that sepsis need not be feared.

The myomectomy clamp cannot be applied while the child is in the uterus, so that, in a non-viable case, if it is determined to conserve the uterus and pregnancy, the surgeon must do without it, minimising the bleeding by compressing the base of the tumour whilst enucleating it, and then immediately suturing the enucleation cavity. If, the child being viable, Cæsarean myomectomy is decided on, the surgeon will be greatly helped by the special myomectomy clamp mentioned on p. 435. This and the ring forceps on the ovarian vessels should be applied immediately after the child has been delivered and before the placenta is removed, after which the tumours are separately enucleated.

ii. Pressure.—The pressure may be due either to the pelvic environment of the tumour or to its mere bulk. If the pressure symptoms are merely due to the incarceration of a retroverted gravid uterus containing one or more insignificant myomata, and can be relieved by rectifying the displacement under an anæsthetic, this should be done. But in all other cases of pelvic impaction, and in all cases of myomata situated in the abdomen and giving rise to pressure symptoms, the abdomen should be opened and the tumour

or tumours removed, with or without the uterus, the pregnancy in the latter case being left *in situ* if possible.

iii. Torsion. The abdominal cavity must be opened, and if the torsion merely involves the pedicle, the surgeon should be able to remove the tumour and leave the uterus; but if the latter itself is twisted, it will probably have to be removed as well, Cæsarean section being first performed if the child is viable.

iv. Anticipation at term of obstruction to delivery, or of trouble in the puerperium.—Choosing a date a few days before labour is expected, the abdomen should be opened and the condition investigated. The surgeon should then choose an area on the uterine wall where there are no tumours and, incising there, deliver the child by Cæsarean section, after which the tumour or tumours may be enucleated, or hysterectomy performed, according to which seems best to him. He should never cut through a tumour (except it be a very small one) to get at the child, as this procedure will entail much bleeding. Directly the child is delivered the special myomectomy clamp should be applied if myomectomy is decided on.

Conclusions.—The ideal treatment of all cases of myomata complicated by pregnancy in which an operation is indicated earlier than the 34th week is to remove the myoma only, and allow the pregnancy to continue. This operation is easy to perform when the number of tumours is small and favourably situated, but it is sometimes associated with severe bleeding. This can generally be arrested by tiers of catgut sutures. As, however, arrest may necessitate emptying the uterus, or even removing it, the operation should never be undertaken without warning the patient beforehand. Moreover, the surgeon may find on opening the abdomen that the number and situation of the tumours forbid an attempt to conserve the pregnancy or even the uterus. The percentage of miscarriages following myomectomy varies, according to the skill and experience of the surgeon. We have many times removed fibroid tumours by enucleation during various periods of pregnancy, the subsequent labour proving normal.

It is particularly to be remembered that, owing to the softness of the wall of the pregnant uterus, a sessile tumour may give the impression of being pedunculated before the abdomen is opened.

When myomectomy has been performed, the pregnancy being left in the uterus; the patient should be kept under the influence of morphia for 3 days. The abdominal wound should be very firmly sutured to stand the strain of labour.

When the child is viable, myomectomy is again to be preferred, for a living child by Cæsarean section can then be assured, and enucleation of the tumour or tumours can, in most instances, be undertaken without undue hæmorrhage, as has already been described.

MYOMA AND LABOUR

For operating upon a myoma in labour the indications are obstruction and hæmorrhage.

Obstruction.—This may be due to—

- i. A submucous myoma situated below the presenting part.
- ii. A subperitoneal myoma below the presenting part.
- iii. An interstitial or cervical myoma.
- iv. A broad-ligament myoma.

Treatment. i. *Submucous myoma.*—If this is polypoid in form and protruding below the head of the child, the stalk should be cut through and the tumour removed, after which the labour may be allowed to proceed. If the tumour is sessile and small and projecting into the cervical canal below the child's head, its capsule should be incised and it should be enucleated. If the tumour is too large safely to follow this procedure, Cæsarean section followed by hysterectomy is the course most likely to be followed, because a tumour as low down as this is probably infected. In suitable cases, however, myomectomy may be performed.

ii. *Subperitoneal myoma.*—If the myoma is pedunculated, one may be able to push it above the presenting part at once and without difficulty, the patient being under anæsthesia. If so, this may be done, and the child delivered by the forceps. It cannot be denied that there is a certain element of danger in this treatment: we remember a case in which the tumour was displaced with ease, and yet, becoming necrosed, killed the patient within a week. Further, the supposed myoma may be an ovarian cyst, and may be ruptured in the process.

In following this treatment, the medical attendant should keep a very careful watch on the patient, and if the tumour subsequently causes any bad symptoms it should be at once removed; otherwise it may be left to be dealt with when the patient is convalescent.

The alternative is immediately to open the abdomen, perform Cæsarean section, and then either remove the uterus or enucleate the tumour.

When adequate means for performing an abdominal operation are to hand this is undoubtedly the best treatment, while if an attempt to push the tumour up has failed, to open the abdomen is the only course available, whatever the circumstances.

iii. *Interstitial, cervical and broad-ligament myomata.*—The abdomen must be opened, Cæsarean section performed, and the tumour removed, with or without the uterus.

Hæmorrhage.—Cases are on record in which intraperitoneal bleeding has occurred during labour from omentum having been torn off the surface of a uterine myoma to which it was previously adherent, or from the rupture of large veins spread over its surface. In such

circumstances abdominal section would at once be indicated. Cases are on record in which fibroids have occasioned such uncontrollable postpartum hæmorrhage that hysterectomy was the only course.

MYOMA AND THE PUERPERIUM

After labour or miscarriage, uterine myomata may imperil life on account of infection, degeneration, pressure, torsion or extrusion.

Infection may result from bruising during delivery or the introduction of septic organisms into the cavity of the uterus. Of the various forms of degeneration which may occur, red necrobiosis is the commonest. Pressure may be due to the sinking down of the tumour into the pelvis after the uterus has emptied itself. Torsion occasionally occurs owing to the alteration of its intra-abdominal relations following retraction of the uterus. Extrusion is probably primarily due to intra-uterine sepsis causing ulceration of the capsule of the tumour.

Treatment.—Infection, degeneration, pressure and torsion must all be dealt with by abdominal section. If the uterus is infected, total hysterectomy will be needed, with drainage of the pelvic cavity. If the complication of degeneration, pressure or torsion necessitates an operation, myomectomy should be the operation of election, though in some cases it may be necessary to remove the uterus.

Extrusion, being always a septic process, should be dealt with by vaginal enucleation.

CARCINOMA OF THE CERVIX COMPLICATING PREGNANCY

The treatment may be divided into four classes :

1. When the cancer is operable and the child is not viable.
2. When the cancer is operable and the child is viable.
3. When the cancer is inoperable and the child is not viable.
4. When the cancer is inoperable and the child is viable.

1. Cancer operable and child not viable.—Cases of this sort may either be treated by radical extirpation as described at p. 364, or by radium. In either case the pregnancy will be sacrificed except, perhaps, when the growth is so very early that it would be possible to apply the radium without infringing on the cavity of the uterus. In most cases, however, it will be better to empty the uterus by hysterotomy before inserting the radium. Vaginal evacuation has the disadvantage of disturbing and perhaps disseminating the growth.

In certain circumstances it is justifiable to employ radium to delay the growth until viability is reached, and then perform Wertheim's operation. One of us (C.B.)* in 1913 thus dealt with a young woman

* Comyns Berkeley, *Jour. of Obst. and Gyn. of Brit. Emp.*, 1934, Vol. XLI, No. 6, 402

pregnant of her first child. The growth was a very early one, and 2 months was required to attain viability. Radium was therefore inserted into the growth on two successive occasions to inhibit it, and with complete success, for it remained stationary until the required period had elapsed, when, the child being delivered by Cæsarean section, radical extirpation was immediately proceeded with. It is interesting to note that the child was born with two bald patches on its head, the result of the radium. Both the mother and child are alive and well to-day.

2. Cancer operable and child viable.—The proper treatment is a Cæsarean section, followed by Wertheim's operation, which in these circumstances is easier than usual.

An alternative is to perform Cæsarean section only, and then apply radium, but when the requisite skill is available we favour the first course.

3. Cancer inoperable and child not viable.—It is very difficult to give a decided opinion as to the correct treatment in this case. Various factors have to be taken into consideration. If abdominal examination disclosed that the patient was not more than 4 months pregnant, undoubtedly the proper treatment would be to evacuate the uterus *per abdomen* and apply radium to the growth. We think this to be the proper treatment, because—(1) The patient may not live till the child becomes practically viable, i.e. the 36th week, if the case, when it comes under treatment, is already inoperable by the modern standard (pp. 371-372). (2) The presence of the pregnancy accelerates the growth and makes the hæmorrhage much worse. (3) Pregnancy itself means the supervention of a good deal of additional distress.

If the pregnancy is not discovered until after the 4th month, we think it might (if the patient wished it) be allowed to go on till the child is viable, and then be terminated by Cæsarean section, radium being applied in the meanwhile.

4. Cancer inoperable and child viable.—The child must be delivered by Cæsarean section, and radium applied.

CARCINOMA OF THE CERVIX COMPLICATING LABOUR

The treatment may be divided into three classes :

1. Cancer operable.
2. Cancer inoperable, child alive.
3. Cancer inoperable, child dead.

1. Cancer operable.—If the patient is in the first stage of labour, that is when the os is not yet fully dilated and the presenting part is still in the uterus, the best treatment is a Cæsarean section, followed by radical extirpation. An alternative but inferior treatment would be to perform Cæsarean section only and then apply radium.

If the presenting part has come through the cervix and is in the vagina, then the labour must be allowed to terminate and the uterus be subsequently removed by a radical extirpation, or radium applied.

2. Cancer inoperable.—If the growth be inoperable and the head still within the cervix, Cæsarean section followed by radium is the proper treatment. If, on the other hand, the presenting part is already in or through the cervix, the child should be delivered from below and radium applied as soon as the involution of the parts will permit it.

CHAPTER XXVII

OPERATIONS ON THE INTESTINAL CANAL

APPENDICECTOMY

CERTAIN surgeons, whose zeal, we venture to think, outruns their judgment, contend that, every time the abdomen is opened for a gynæcological cause, the appendix should be removed even when it is not diseased. We strongly dissent. Even if no risk were added to the operation by this additional procedure, the appendix belongs to the patient and the operator has no right to remove it without the owner's consent, expressed or implied. If, in the course of a gynæcological operation, the appendix is found to be diseased, it is the duty of the operator to remove it.

As a fact, however, any extension of an operation does increase its risk, and very definitely so when the addition involves cutting across a portion of the intestinal canal. We call to mind, in particular, a tragic case in which appendicectomy, unnecessarily added to an operation for retroversion of the uterus, brought about the death of a young girl. If, however, the patient requests the operator to remove her appendix in the course of a gynæcological operation, even if it is not diseased, he is justified in so doing, provided that such an extension of the operation does not increase the sum total of the risk to an unwarrantable extent.

The load of responsibility that a surgeon shoulders every time he performs an operation is surely great enough without adding to it by meddlesome chippings and choppings. We have noticed that such foolish zeal is usually in inverse proportion to skill and experience.

Instruments.—*See* p. 274 ; also straight and curved Souttar's needles.

Operation. *i.* Opening the abdominal cavity.—When appendicectomy is merely an incident in a gynæcological operation, it is, of course, carried out through a median incision. For a primary appendicectomy on women, a middle-line incision has the great advantage that it enables a full exploration of the pelvis to be made, thus obviating such a mistake as leaving a pyosalpinx behind while the appendix has been removed. In all cases in which there is a doubt of the nature of the lesion for which the patient is to be operated upon, the median incision should be chosen. When, however, there is no doubt about the diagnosis

of appendicitis, a lateral incision is justifiable, and that which we prefer is parallel to the outer border of the rectus.

ii. Clamping and dividing the meso-appendix.—Any adhesions present having been separated, and the appendix having been pulled up and steadied with one pair of forceps at its end and another at its base, its mesentery is either clamped by pressure forceps, the vessels being thus temporarily secured, or secured *en masse* by a ligature. The mesentery is then divided throughout its whole length up to the cæcum, close to the appendix, and the appendix is set free (Fig. 525).

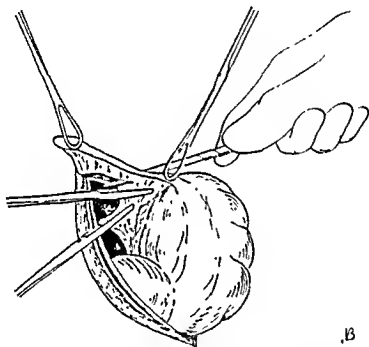


Fig. 525.—Appendicectomy : Dividing the meso-appendix.

iii. Ligaturing the meso-appendix.—The vessels in the mesentery, if not already ligatured, are finally secured with ligatures of fine catgut or silk.

iv. Crushing the appendix.—The appendix is now held up by its free end and is crushed with a strong pair of forceps just at its origin from the cæcum (Fig. 526).

v. Ligaturing the appendix.—A ligature is then passed round the crushed area of the appendix and tied (Fig. 527).

vi. Inserting the purse-string suture.—The appendix is now held up by its tip and a purse-string suture of silk No. 1 or catgut No. 0 20-day threaded in a thin round-bodied needle, is passed through the cæcal wall around and about half an inch from its base (Fig. 528).

vii. Amputating the appendix.—A forceps is applied about one-third of an inch distal to the ligature, to prevent the escape of the appendicular contents, and the appendix amputated about one-eighth of an inch above the ligature with a scalpel (Fig. 529). The stump of the appendix should then be touched with pure carbolic acid.

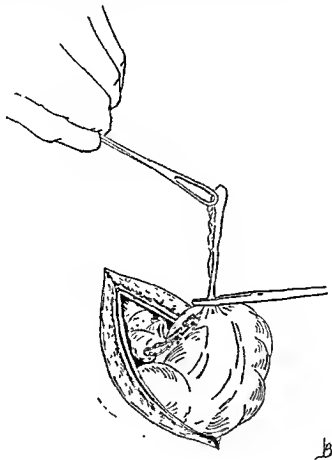


Fig. 526.—Crushing the base of the appendix.

viii. Burying the stump.—The purse-string suture passed through the serous coat of the cæcum is now tied, and as this is pulled tight, the stump of the appendix is invaginated by an assistant pushing it in with the end of a pressure forceps, the blades being kept closed so that it is entirely buried (Fig. 530).

Difficulties.—Difficulty may arise from dense adhesions to bowel, mesentery, or omentum. A retrocaecal position of the appendix always makes its removal more difficult, especially when the surgeon is working through a middle-line incision. In some of these cases the appendix

is entirely sessile along the back of the cæcum and ascending colon, and its tip may be almost as high as the liver. In such an event the ordinary method of removal is not applicable. In this case the operator, having crushed and ligatured the base of the appendix, as already described, should free it at its base and then proceed with the separation

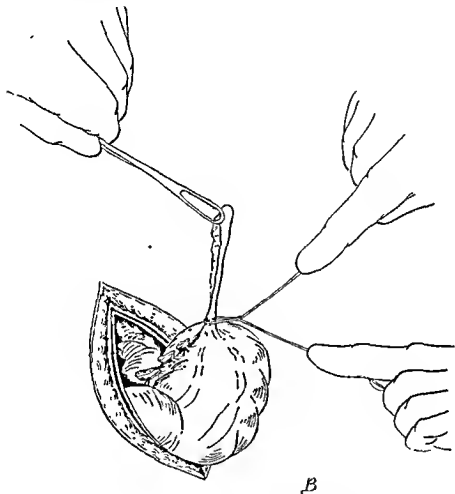


Fig. 527.—Ligaturing the base of the appendix.

of the remaining portion of the appendix in the reverse direction to that usually adopted, clamping each successive portion of the appendicular attachments as they are divided and then ligaturing them. Occasionally an artery in the meso-appendix may be punctured, with the result that a large ligature-hæmatoma may form (see p. 47).

Dangers.—When amputating the appendix, faecal or purulent matter may escape. The field of operation and the wound edges, therefore, should always be carefully packed off with swabs and towels in addition

to the application of sheet rubber as shown in Fig. 191. When very dense adhesions exist, the bowel, and particularly the ileum, is in danger of being opened unless great care is taken; or the appendix may tear during its separation.

Dressing and after-treatment.—See p. 24 and Chapter xxx. In cases of chronic appendicitis, drainage is not necessary, but when a

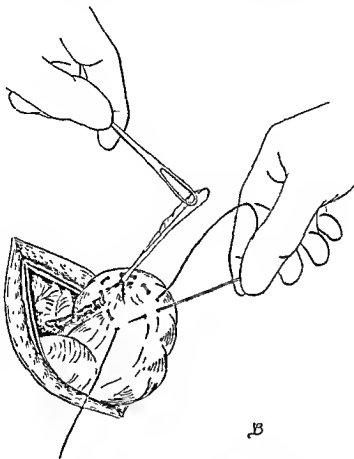


Fig. 528.—Inserting the circular invaginating suture.

pyo-appendix has been removed and the surrounding peritoneum has possibly been contaminated with pus, it is better to insert a very small drainage-tube down to the stump and leave it there for 48 hours. If the appendix is gangrenous, or a local peritoneal abscess is present, it should be evacuated and drained by a large tube through an iliac incision, and the median abdominal incision should be utilized to pass a tube into the pelvis so as to prevent the accumulation there of pus, a happening extremely likely in such cases. Penicillin and sulphathiazole powder applied locally has proved very valuable.

Lastly, if diffuse peritonitis is present, the appendix should be removed by means of a *right iliac incision*, through which a large tube is subsequently inserted down to the site of the stump. The pelvis should then be drained through the *median incision*, and in most cases a third opening is also made into the *right lumbar pouch*, so as to



Fig. 529.—Amputating the appendix.

obviate the extension of pus behind the ascending colon and the formation of a subphrenic abscess. Finally, in a few cases of complete general peritonitis, drainage incisions should also be made into the left iliac and left lumbar pouches. The patient should be propped well up as soon as possible after the operation. Penicillin and sulphathiazole powder locally and penicillin by intramuscular, and/or sulphathiazole by oral administration are strongly indicated.

ENTERECTOMY

During the course of an operation on the female genital organs it may be found necessary to excise a portion of the intestine. Again, an operation may be started on the assumption that a mass felt *per abdomen* or *per vaginam* is connected with the uterus or its appendages, but when the abdominal cavity is opened it is found to be otherwise,

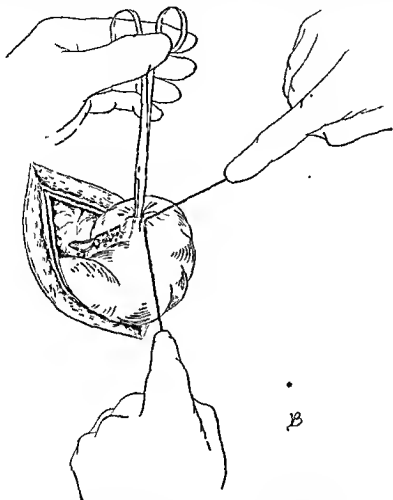


Fig. 530.—Burying the stump of the appendix.

and that the only proper treatment is enterectomy. We shall first describe the method of end-to-end anastomosis.

END-TO-END ANASTOMOSIS

Operation. i. Excising the bowel.—The portion of bowel to be removed having been drawn well up into the wound, the abdominal contents are carefully packed off with swabs and towels and the wound

edges properly protected; four pairs of bowel clamps and two pairs of ring forceps are applied as follows: A bowel clamp is applied on one side of the diseased area to be removed, but well away from it. A second clamp is applied about half an inch from it. A third clamp is next applied on the other side of the diseased area but well away

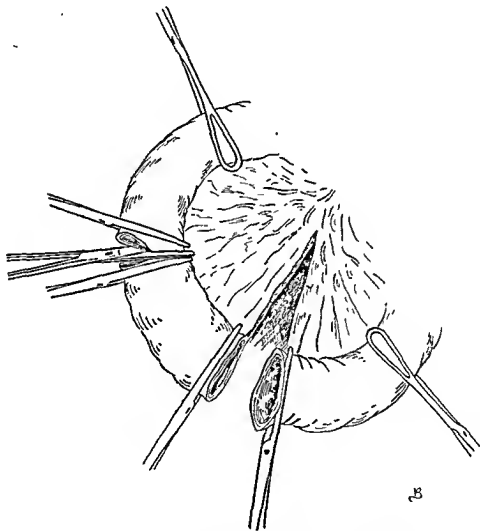


Fig. 531.—Enterectomy with end-to-end anastomosis:
Dividing the intestine.

from it, and a fourth clamp is applied half an inch from it. In addition, two ring forceps are applied to the bowel some distance proximal and distal to the clamps already applied, in the manner shown in Fig. 531. The mesentery should not be included in the clamps. The bowel is then divided with scissors between the two pairs of bowel clamps on each side of the diseased area (the contents of the excised portion

being thus prevented from escaping), together with a V-shaped portion of the mesentery corresponding to the portion of bowel excised.

ii. Ligaturing the mesenteric vessels and emptying the proximal portion of the bowel.—All bleeding-points in the mesentery are secured with pressure forceps and ligatured. If the portion of bowel resected is distal to the hepatic flexure of the colon, and it is found that the bowel above it is loaded with retained scybalæ, it is most essential that these

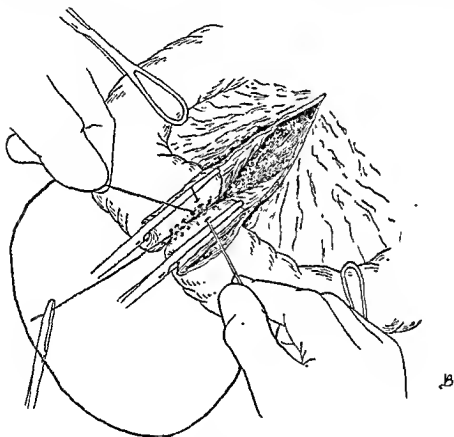


Fig. 532.—Beginning the outer suture.

should be removed before the anastomosis is proceeded with, or their passage will subsequently endanger the integrity of the suture-line. Having, therefore, most carefully covered up everything with sterilized cloths except the proximal portion of bowel, the surgeon proceeds to remove the clamp and ring forceps securing its cut end and milks the intestinal contents into a porringer. The clamp and ring forceps are re-applied to the intestine as before, and the parts are carefully washed with sterile saline solution.

iii. **Trimming the cut ends of the intestine.**—The mucous coat of the cut ends may be found somewhat ragged and excessive, and this should be trimmed up so that it is flush with the muscular coat.

iv. **Inserting the first half of the outer suture.**—The clamps holding the

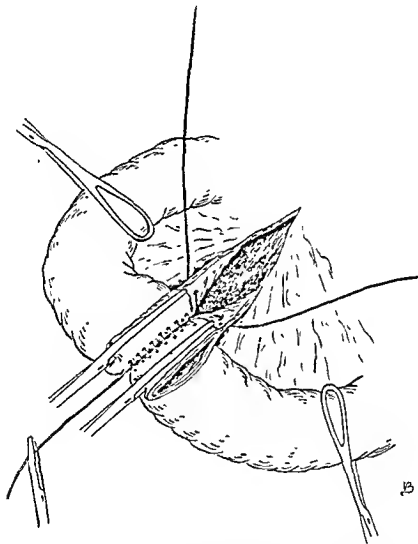


Fig. 533.—The ends of the outer suture passed through the mesentery on either side.

ends of the cut bowel are rolled in opposite directions; the peritoneal surfaces of the bowel-ends, having been brought into contact, are sutured together by a continuous Lembert's suture of No. 2 silk affixed to a Souttar's needle. The suture should start at the anti-mesenteric border of the bowel-ends and be continued until the mesenteric attachments are reached, when it is tied (Fig. 532).

v. Passing the sutures through the mesentery.—The tying should be such that two long ends are left, one of which is then passed through the mesentery just below its junction with one cut end, while the other is passed through the mesentery where it joins the other bowel-end at a corresponding point (Fig. 533).

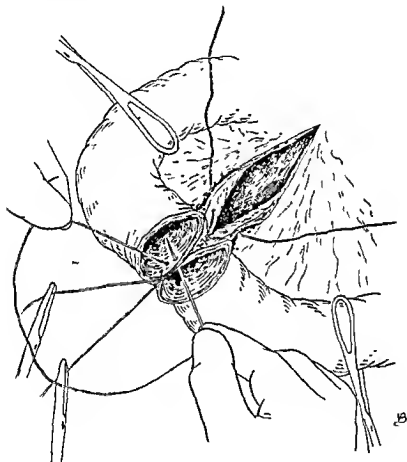


FIG. 534.—The first half of the inner suture.

vi. Inserting the inner suture.—The clamps having been taken off the cut edges, the bowel-ends are then brought together by a suture of No. 0 20-day catgut affixed to a Souttar's needle, and passed through the mucosa and muscularis of the bowel at the anti-mesenteric points (Fig. 534). This suture is continued until the points of mesenteric attachment are reached, where it is tied. The suture is now continued round the other half of the lumen of the bowel, but this time as a Connell suture, inturning the mucous membrane (Fig. 535). Having reached the anti-mesenteric point, the suture is then tied to the long end of the

suture where it started. The lumen of the bowel being thus restored, the two ring forceps are removed.

vii. **Completing the outer suture.**—The surgeon now ties the two ends of the sutures which he has previously passed through the mesentery. He then continues one end as a continuous Lembert's suture round

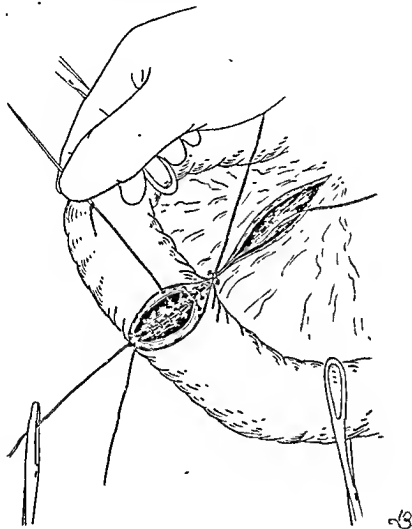


Fig. 535.—The second half of the inner suture.

the bowel, until the anti-mesenteric border is reached, where it is tied to the long end left where the suture originally began (Fig. 536).

viii. **Third row of sutures.**—In the case of the small intestine further sutures are not required and, indeed, are to be avoided, because a third row narrows the lumen of the gut at the point of anastomosis. In the case of the large intestine, however, it may sometimes be advantageous to apply a third row of sutures to bury the second row. These sutures should be of the interrupted Lembert variety.

ix. Suture of the mesentery.—The gap in the mesentery is closed with a continuous suture, for which one of the loose ends of the original anchoring suture may with advantage be used. Care must be taken not to include a vessel in them, especially in the small intestine, for fear of injuring the blood-supply to the bowel.

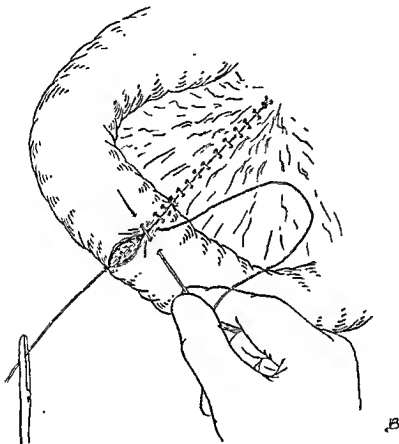


Fig. 536.—Completing the outer suture.

x. Closing the abdominal wound.—The anastomosis should now be carefully examined for any gaps or loose sutures, and, none being found, it should be freely washed with warm saline solution, after which the abdominal wound should be closed by the method described on p. 286. When there is any doubt of the suture-line holding, a very small tube should be inserted down to the sutured coil for 2 or 3 days.

Alternative Method.—While the method of anastomosis we have just described is, in our opinion, the best for the large intestine, the following method is better suited for the small intestine, especially when it is very small and shrunken.

i. **Anchoring the cut ends.**—A suture of No. 2 silk, affixed to a Souttar's needle, is passed through the mesentery of one piece of intestine just at the point where it joins the bowel, after which it is brought back through the mesentery belonging to the other end of the bowel.

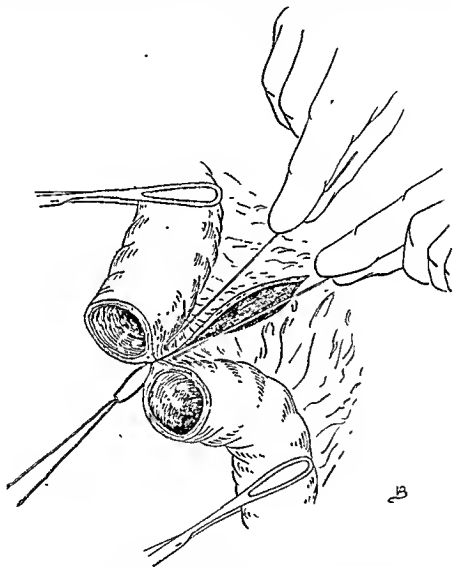


Fig. 537.—Alternative method: Anchoring the mesenteric angles.

Round the loop of the mattress-suture so formed, another piece of No. 2 silk is tied. The mattress-suture itself is then tied, thus bringing the mesenteric angles of the cut bowel ends together, with two long ends of suture on either side, pressure forceps being then applied to each pair (Fig. 537).

ii. **Applying the first row of sutures.**—The mucous membrane and the muscular coats of the cut ends of the intestine are now joined with a continuous suture of No. 0 20-day catgut, affixed to a Souttar's needle,

beginning at the middle point of the lateral margin of the cut lumen on the one side, and being carried stitch by stitch across the situation of the mesenteric attachment to the same point on the other side (Fig. 538). In order to hold taut the edges to be sutured, it is a good plan to pass a single interrupted suture through the middle

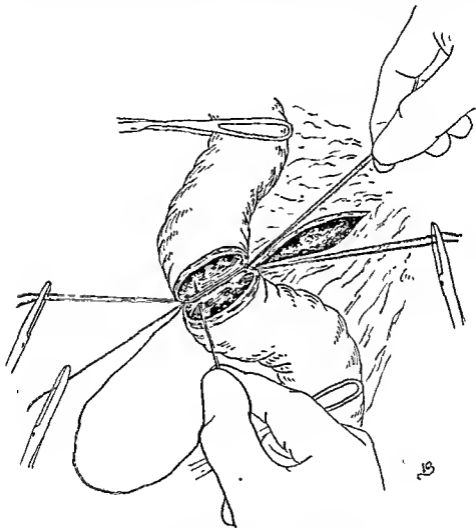


Fig. 538.—Insertion of the inner suture.

point of the lateral margin on the other side, on the long ends of which the assistant makes traction. When the continuous suture reaches this point it is tied to one end of the single suture, while the other end is carried as a continuous Connell's suture (*see p. 36*), so as to invert the mucous membrane, round the antimesenteric half of the lumen and then tied to the free end belonging to the continuous suture first inserted.

iii. Second row of sutures.—That end of the suture which anchored the two pieces of mesentery together, to which a Souttar's needle is attached, is now continued half-way round the bowel as a Lembert's suture, picking up the peritoneum and subjacent muscle until the anti-mesenteric border is reached, where it is tied and one end cut short. One end of the two suture ends on the other side, to which another needle is affixed, is then carried round the other half to meet the first

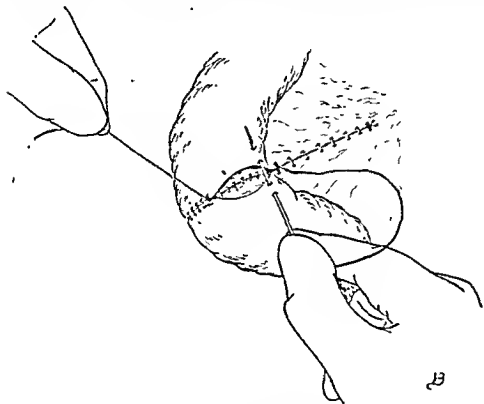


Fig. 539.—Insertion of the outer suture.

suture at the anti-mesenteric border, when the two ends are tied together (Fig. 539). The gap in the mesentery is then closed.

iv. Third row of sutures.—The remarks already made on this point when describing the first method apply equally here.

After-treatment.—It is our practice to treat all cases of intestinal resection by withholding for a week all nourishment calculated to produce a residue in the bowel, maintaining the strength and alleviating the thirst by water, clear meat essences, fruit juice and glucose. If necessary, rectal injections of saline and glucose solution may be given.

At the end of a week the bowels are opened by a mild aperient, preceded, for 2 days beforehand, by a glycerin enema in the morning and liquid paraffin three times a day. After the bowels are open solid food is given.

In other respects the general lines of the after-treatment of these cases are the same as those described at p. 24 and Chapter xxx.

END-IN-SIDE ANASTOMOSIS

This method, which has several applications, is typically employed in the operation of excision of the cæcum, though end-to-end union of

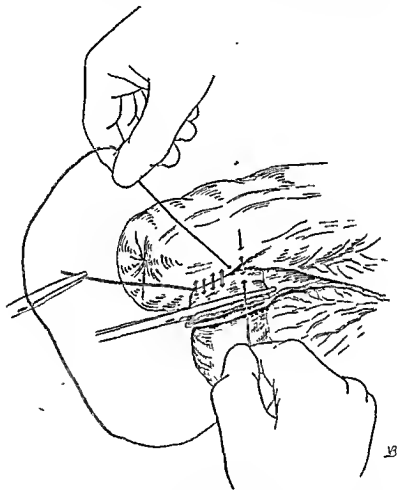


Fig. 540.—Enterectomy: End-in-side anastomosis: Beginning the outer suture.

the ileum and ascending colon may be preferable if the small intestine be distended and the colon collapsed. We shall describe the method as applied to the cæcum.

Operation. i. *Excising the cæcum.*—A narrow clamp is applied just above the point of projected division of the ileum, and a similar one just below it, and the bowel between them is divided.

The distal portion of the ileum is now freed by dividing its mesentery down to the ileo-cæcal junction. The peritoneum attaching the cæcum to the parietes is then divided and the cæcum is raised up and freed by dividing its inner attachments, which contain the vessels going to it. These vessels are secured with forceps before they are cut and subsequently ligatured.

The cæcum and the portion of ileum attached to it are then pulled

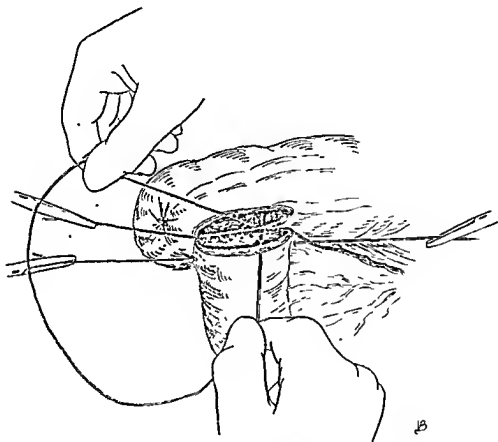


Fig. 541.—The first half of the inner suture.

up until the ascending colon comes into view, and the point of its division having been decided on, a crushing clamp is applied at that point and the bowel is flattened out. A ligature is now tied tightly round the flattened portion, and the cæcum and portion of ileum are then cut away.

ii. Closing the cut end of the ascending colon.—The distal cut end already occluded by the circular ligature, is now invaginated by a purse-string suture which hurries the crushed portion.

iii. Implanting the ileum.—The cut end of the ileum is next brought

up to the point where it is to be implanted and the clamp temporarily closing the cut end is rolled over, so as to present the peritoneal surface of the ileum to that covering the point of implantation (Fig. 540), and the two are united by means of a continuous silk suture, No. 2, both ends of the suture being left long after the knots are tied.

An opening is now made into the ascending colon of a size corresponding to the calibre of the cut ileal end. The clamp having been taken off, the circumference of the open end is sutured to the circumference of the hole by means of a continuous suture of No. 0 20-day catgut, the suture passing through both the muscular and mucosal layers (Fig. 541).

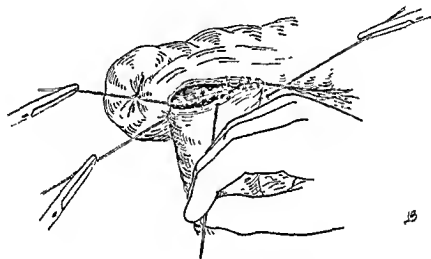


Fig. 542.—The second half of the inner suture.

When suturing the upper half of the circumference of the two openings, the suture should be passed in the manner described as Connell's suture (Fig. 542). This inturns the mucosal edges.

The suture which first united the peritoneal surfaces should now be continued right round the junction, utilizing for the purpose one of the ends which were left long, and completing it by tying it to the other long end.

The junction must now be examined, and any weak points reinforced by additional points of suture.

The cut edge of the mesentery of the ileum should be attached by a few sutures to the peritoneum reflected off the inner side of the ascending colon, care being taken not to prick any of the colic vessels. The raw area left by the removal of the cæcum is then closed by drawing in the peritoneum on either side of it with sutures.

LATERAL ANASTOMOSIS

This is employed for short-circuiting and for anastomosis when the two ends are markedly different in calibre and when their mobility is such as to allow of their easily sliding one over the other.

Operation.—The technique is similar to that just described, but

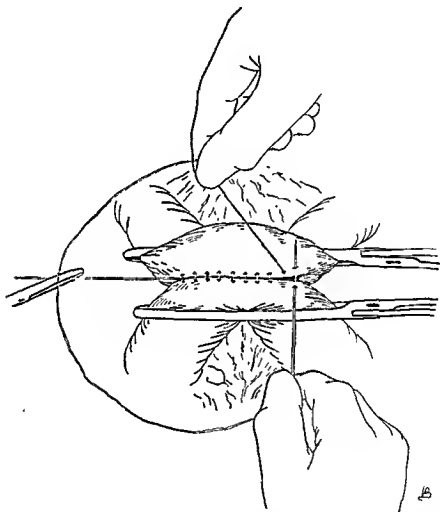


Fig. 543.—Lateral Intestinal anastomosis: Beginning the outer suture.

both ends have to be closed by invagination, so that the crushing clamp should be applied to the upper as well as the lower points of division.

The ends being closed, clamps are applied laterally to the upper and lower parts of the bowel, and the portions isolated by the clamps are brought into apposition and fixed to one another by a continuous suture picking up the peritoneal and muscular coats (Fig. 543).

Openings are now made into each isolated portion, and the edges are sutured together with a continuous suture in the manner already

described for end-in-side anastomosis (p. 716. Figs. 541, 542, 543 and 544). The union is then completed by continuing the peritoneal suture right round the junction, the lateral clamps being first removed.

Difficulties.—The operation of intestinal anastomosis is, as a rule extremely simple and, when not performed in conditions of acute intestinal obstruction, very successful. On occasions, however, its performance is difficult, as when the loop of gut cannot be brought out of the wound owing to shortness of the mesentery.

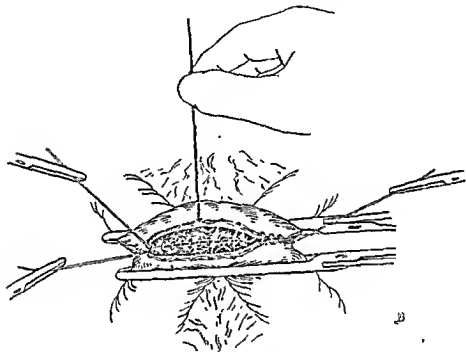


Fig. 544.—The second half of the inner suture.

The particular method to be chosen depends on the case. In general, end-to-end union is the best because it only leaves one suture-line.

When marked disparity between the calibre of the bowel-ends exists, one of the other methods must be employed, though slight inequality can be met by dividing obliquely the bowel with the lesser lumen. If this is done it is important that the division should be so arranged that the point of mesenteric attachment is salient, for if the anti-mesenteric half of the edge projects beyond the mesenteric half there is a great risk of necrosis.

In all cases when possible the anastomosed coil should be left immediately under the abdominal wound, and when from any reason

the suture-line is likely to yield, a drainage-tube should be inserted as previously advised.

COLOSTOMY

In gynaecological surgery colostomy has to be performed in such circumstances as an irremovable pelvic tumour with intestinal obstruc-

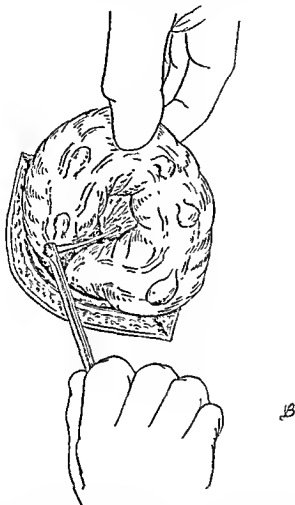


Fig. 545.—Colostomy: Beginning the insertion of the mattress-suture.

tion, in certain cases of diverticulitis, as a safeguard when the bowel has been injured and sutured in the course of a pelvic operation; also as a preliminary to excision of the rectum and lower colon and as part of the procedure for curing difficult cases of recto-vaginal fistula when the fistula is situated high up.

Preparation of the patient.—See p. 78.

Position.—The patient should lie in the horizontal position.

Instruments.—See p. 274. In addition, a Paul's tube may be required if the bowel is to be immediately opened.

Operation. i. Opening the abdominal cavity.—In left inguinal colostomy the incision should be parallel with the outer edge of the left rectus muscle, the upper end of the incision reaching a line drawn between the umbilicus and the left anterior superior iliac spine.

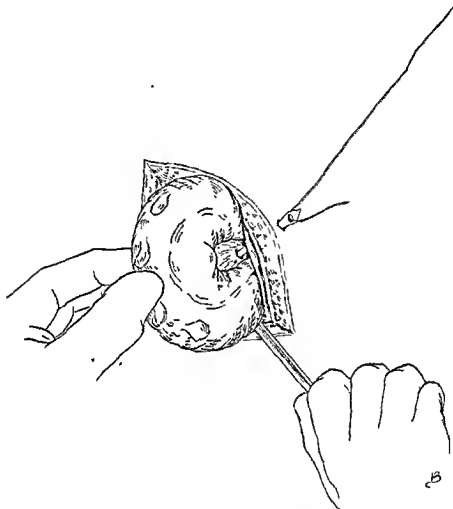


Fig. 546.—Continuing the insertion of the mattress-suture.

ii. Mobilizing the colon.—If the mesocolon is short it will be necessary to mobilize the bowel by dividing the peritoneum on the outer side of the mesocolon parallel with the direction of the bowel. It is important that the loop fixed should be under no tension.

iii. Anchoring the loop of intestine.—A loop of the pelvic colon is pulled up and anchored to the parietes by passing a mattress-suture of thick silkworm-gut through the mesentery and the peritoneum, fascia and skin on both sides in the manner shown in Figs. 545, 546, 547. The mattress-suture when tied anchors the bowel to the parietes and

creates the necessary spur. In order to facilitate the removal of this suture, which by the time it has to be taken out has usually cut itself deeply in, it will be found very advantageous to pass a piece of silk under the loop of the mattress-suture, opposite to the point where the latter is tied (Fig. 548), and to leave the ends of the knot long.

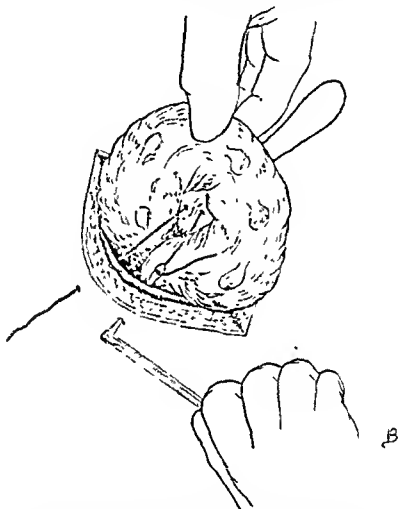


Fig. 547.—Completing the insertion of the mattress-suture.

The suture will cut in less if a small piece of rubber tubing covers its U. An alternative method is to pass two simple sutures in the same manner as the mattress-suture and then for the surgeon to tie the two ends on his side while the assistant ties the two on his side at the same time.

iv. Fixation of the intestine at the upper and lower angles of the wound.—The intestine is tethered to the upper and lower angles of the wound by silk sutures passed through the abdominal skin and the muscular and peritoneal coats of the bowel, the suture after being tied at either end of the projecting bowel being re-tied over an appendix epiploica for extra security (Fig. 549).

v. Opening the bowel.—The bowel is incised in its long axis with a scalpel for about three-quarters of an inch. It should never be divided transversely, for if this is done there is considerable likelihood of the bowel tearing right across, in which event the two ends will retract into the abdomen. If it is desired to use a Paul's tube, a purse-string suture is applied well outside the area of the contemplated aperture. In cases

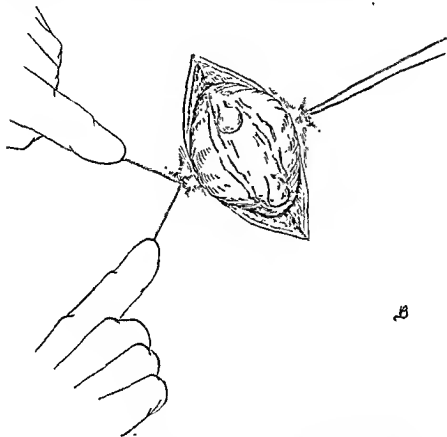


Fig. 548.—Tying the mattress suture with a piece of silk passed under the loop.

of urgency the bowel must be opened at once, otherwise this stage of the operation may be postponed for several days.

iv. Insertion of Paul's tube.—Paul's tube, with a long piece of india-rubber tubing affixed, is rapidly inserted through the hole made by the scalpel, and the purse-string suture is then drawn tight, so that the tube is fixed securely in the bowel.

We ourselves have given up using Paul's tube, which is a somewhat clumsy device, and find that even when the intestine has to be immediately opened ill results do not accrue from allowing the faecal matter to run straight out of the bowel.

Transverse colostomy.—The transverse colon may have to be opened instead of the pelvic colon, particularly in cases in which a large growth is present in the upper part of the pelvic colon or when this segment of the intestine is bound down by an inflammatory or neoplastic mass into the pelvis.

The technique is the same, except that the great omentum must be first detached from the bowel over a length of about 3 inches. The mid-line incision usually allows of the transverse colon being brought

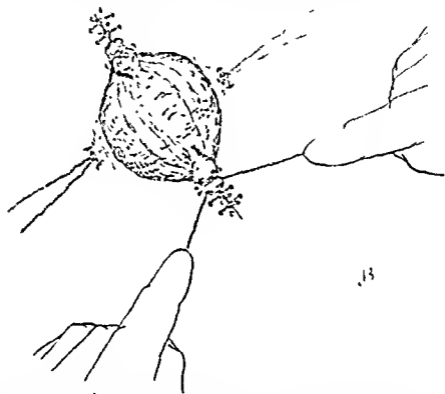


Fig. 549.—Supplementary sutures and tying over an epiploic appendage.

into the wound without any upward extension. If it does not, the wound should be enlarged or initially placed higher.

Dressing.—We cover the colostomy with a sheet of stout silver foil, which is the only substance which will not stick to the bowel. This saves the patient from nearly all the pain and distress associated with the dressing of a colostomy. Outside the silver foil, large pads of absorbent wool are placed over the wound, and are kept in place by a bandage. The india-rubber tube, if one is used, is led away into a receptacle under the bed.

After-treatment.—See Chapter xxx. The bowel, if possible, should be kept closed until pain and distension indicate that the obstruction is having effect. This does not usually happen for 4 or 5 days. It is best to make a very small opening to begin with, and to enlarge it during

the next day or two. The tube, if one has been inserted, is removed about the fourth day, after which the wound is dressed as often as the action of the bowels may render necessary. The skin should be carefully washed with soap and water whenever this is done, and should be protected by smearing it with the mixture of metallic aluminium, zinc oxide and liquid paraffin given on p. 880. The mattress-sutures should be left *in situ* for at least a fortnight, but the other sutures may be taken out a few days sooner.

CÆCOSTOMY

This operation is occasionally called for in conditions of acute

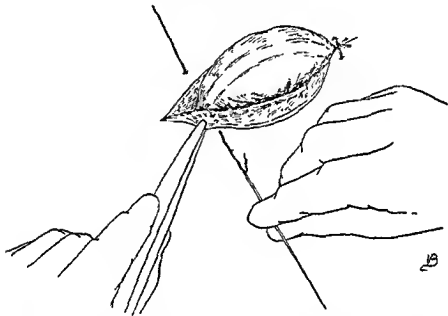


Fig. 550.—Cæcostomy : Suturing the bowel to either end of the wound.

intestinal obstruction in which the exact site of the obstruction is unknown except that it is somewhere in the large intestine, and the condition of the patient is such that an exploratory coeliotomy is not advisable. In these circumstances the operation is remarkably successful and can be performed very quickly. It is also performed as a safety-valve in those cases in which the colon has been anastomosed.

Preparation of the patient.—See p. 78. As the operation has usually to be performed in emergency, the opportunity for pre-operative preparation is limited to the short period on the table before operation.

Position.—The patient will be in the dorsal position.

Instruments.—A scalpel, a dissecting forceps, two pressure forceps, a Reverdin's needle, a couple of curved needles No. 7, and silk No. 4.

Operation. i. Opening the abdominal cavity.—The incision should be made close to the right anterior superior iliac spine. It should be short, have its centre at this point, and lie parallel to the direction of the fibres of the external oblique.

ii. Suturing the bowel.—In such a case as we describe, the distended caecum immediately protrudes through the parietal wound, to each end of which it should be secured by a suture of No. 4 silk passed through the skin and fascia on both sides of the wound and the muscular

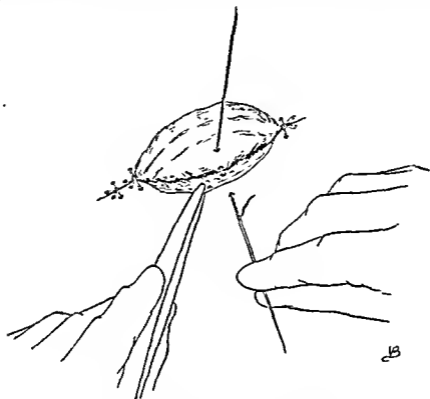


Fig. 551.—Suturing the bowel laterally.

and serous coats of the bowel (Fig. 550). Two lateral mattress-sutures should be applied, one on each side, picking up the skin and fascia and serous and muscular coats of the bowel (Fig. 551). A small opening should then be made in the bowel by stabbing it with the point of a scalpel.

After-treatment.—As for colostomy. The sutures should be removed at the end of 10 days.

JEJUNOSTOMY

In a case of acute obstruction, intestinal or faecal vomiting indicates that the jejunum is full of material similar to that ejected, and it is to this loading of the upper intestine with a heavily infected and exceedingly toxic fluid that the fatal termination is to be ascribed.

After the release of an organic blockage the normal direction of the intestinal current may be resumed and the bowels purge themselves naturally of the noxious material. But in certain cases, in spite of such release, the obstructive condition continues, owing to the paralysis of the bowel-wall, while in primary parietic obstruction no stimulative measures applied to the paralysed segment of gut are of avail (see p. 850).

It is in these two classes of case—viz. those organic blockages in which the symptoms continue after release of the obstruction, and

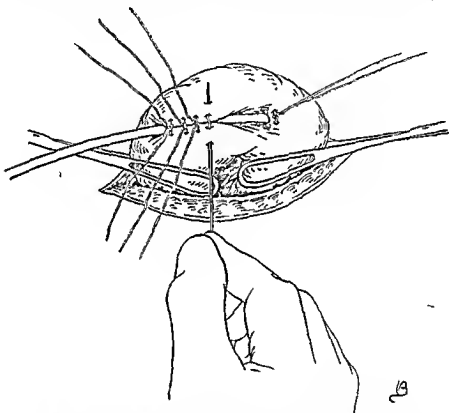


Fig. 552.—Jejunostomy: Fixing and covering-in the catheter.

those in which primary parietic obstruction is present—that jejunostomy is indicated for the purpose of directly draining the toxic upper bowel.

Further, there are certain cases of organic obstruction in which, though release can be satisfactorily effected, yet the distension, the vomiting, and the general condition are so alarming that it appears improbable that the bowel will immediately recover itself. In these, jejunostomy may be performed at the same operation as that by which the obstruction is released.* Duodenal suction has largely replaced jejunostomy; it has the advantage of not requiring a further operation

* Victor Bonney, "Post-operative Paralytic Obstruction with Special Reference to its Treatment by Jejunostomy," *Arch. of Middlesex Hosp.* Nov. 1910, Vol. XXI.

Occasion may, however, arise when the necessary apparatus is not available (*see* p. 857), or it may have failed to relieve the symptoms.

Preparation of the patient.—As the operation is one of emergency, the pre-operative preparation is limited to what can be done on the table.

Position.—The dorsal position.

Instruments.—*See* p. 274.

Operation. i. Opening the abdominal cavity.—The incision should be made through the middle of the left rectus muscle, its length about 2 inches, and its lower end just above the umbilicus.

ii. Inserting and tying in a catheter.—The highest available coil of jejunum is pulled through the wound, emptied by the fingers and occluded by two ring forceps. The coil is then opened by an incision

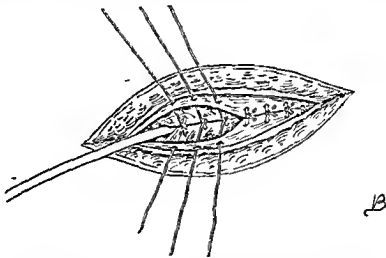


Fig. 553.—Fixing the bowel to the abdominal wall.

large enough to insert one end of a catheter. This end is secured in position by a suture, the ends of which are left long. That portion of the catheter adjacent to the coil of jejunum is now covered in by a series of No. 0 20-day catgut sutures passed through the superficial coats of the jejunum; when tied, this part of the catheter is buried by the overlapping walls of the jejunum. The ends of these sutures are then left long (*Fig.* 552).

iii. Suturing the coil of jejunum to the peritoneum.—The ends of the sutures already mentioned are then passed through the parietal peritoneum and tied as depicted in *Fig.* 553.

iv. Suture of the fascia.—The fascia is now closed by interrupted catgut sutures.

v. Suture of the skin-incision.—The skin-incision is closed with sutures or Michel's clips, the remainder of the catheter projecting through the wound.

The object of this operation is to create a valve-like opening into the jejunum so that after the catheter is taken out the jejunal contents

will not tend to escape and the closure of the opening will be more rapid.

Immediately in some cases, but after a short time in others, a large quantity of brown fluid identical with that lately vomited is discharged, together with much gas. In a successful case the vomiting immediately stops and the abdominal distension and distress disappear.

ALTERNATIVE METHOD

In cases of very great emergency, when the operation must be concluded very quickly, it may be performed under local infiltration anaesthesia by simply stitching the wall of the jejunum to the abdominal

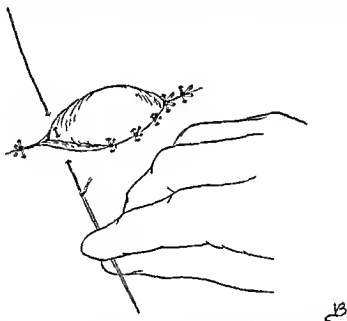


Fig. 554.—Alternative method: Fixing the jejunal coil direct to the skin.

skin by a series of interrupted sutures. The bowel is now opened in its longitudinal axis for about half an inch. The fluid necessarily flows all over the wound, but has never in our experience caused infection of the peritoneal cavity (Fig. 554).

After-treatment.—In a successful case, after 24 or 48 hours the discharge from the bowel becomes yellow and odourless, and healthy bile appears. If the valve operation has been performed, the catheter should be left undisturbed until it loosens of itself, usually in about a week. A tube should be fastened to it and led away into a bottle. After the catheter has been removed the wound usually heals pretty quickly.

If the alternative method has been employed, the skin in the neighbourhood becomes red and excoriated, and the patient rapidly wastes, for food given by the mouth escapes partly undigested from the fistula.

So soon as the abdomen has become flat and all symptoms of the obstruction have departed, the continuity of the bowel must be restored by resecting that portion of the jejunum which contains the fistula and making an end-to-end anastomosis. This can usually be done about 10 days after the operation, during which time the patient must be fed by the rectum or by intravenous saline-glucose infusion, while the skin

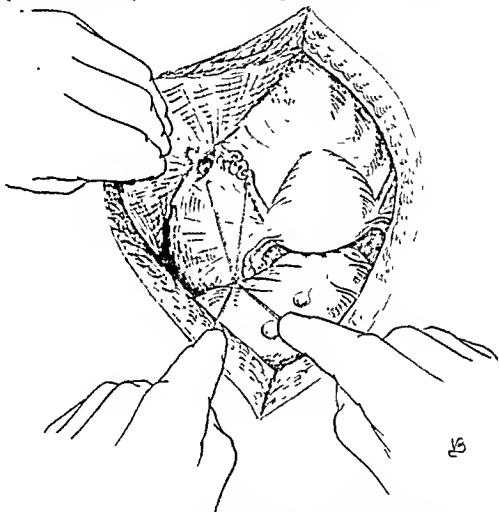


Fig. 555.—Intraperitoneal herniotomy: Closing the neck of an inguinal hernia.

in the neighbourhood of the fistula should be protected by covering it with the thick paste of oxide of zinc, aluminium powder and liquid paraffin described on page 880.

Whenever possible, the valve operation should be done, since it saves the patient from a second operation.

INTRAPERITONEAL HERNIOTOMY

It not infrequently happens that a patient needing an abdominal operation for some disorder of the pelvis has also an inguinal or femoral

hernia. Under such conditions we have for many years dealt with the hernia by closing it from within, thus avoiding a second incision. The mouth of the hernia sac is in close relation to the point where the round ligament leaves the abdominal cavity. In the case of an inguinal

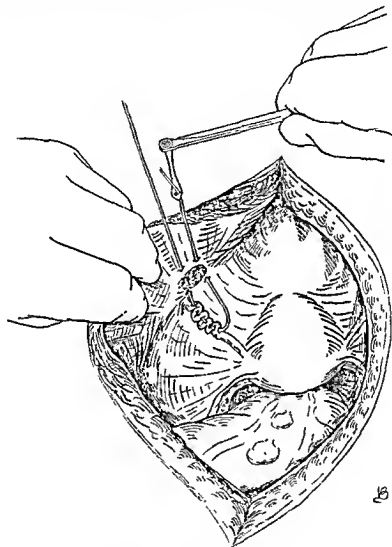


Fig. 556.—Intraperitoneal herniotomy: Closing the neck of a femoral hernia.

hernia it is situated above and to the outer side of that point, while with a femoral hernia it lies below and slightly inside it.

The technique we employ is as follows:

A length of stout silk, No. 4 or No. 6, is run along the round ligament as a puckering suture from just inside the point where it leaves the peritoneal cavity to about its middle. The two ends are now passed

through the edges of the mouth of the sac as a mattress-suture ; or, if the mouth is very large, as a purse-string suture. The ends are now tied, thus closing the mouth of the sac and at the same time bringing the

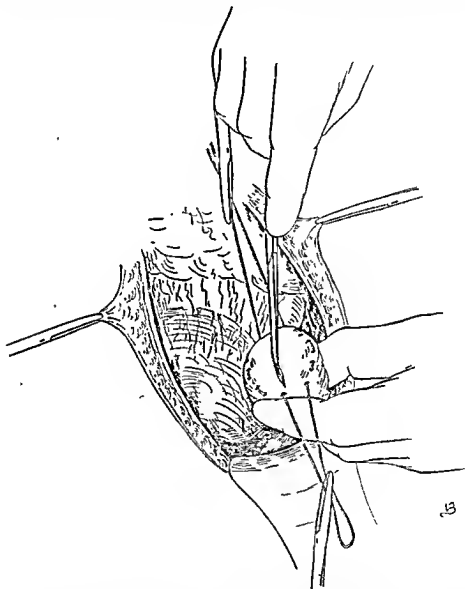


Fig. 557.—“ Ideal ” cholecystostomy : Opening the gall-bladder within the space demarcated by a circular invaginating suture.

mass of the puckered round ligament up against the point of closure to supplement the obturation (Figs. 555, 556).

GALL-STONES COMPLICATING PELVIC DISEASE

If in the course of an operation for pelvic disease gall-stones are discovered, the surgeon has three alternatives: (1) to leave them *in situ*; (2) to remove the gall-bladder; and (3) to remove the stones only.

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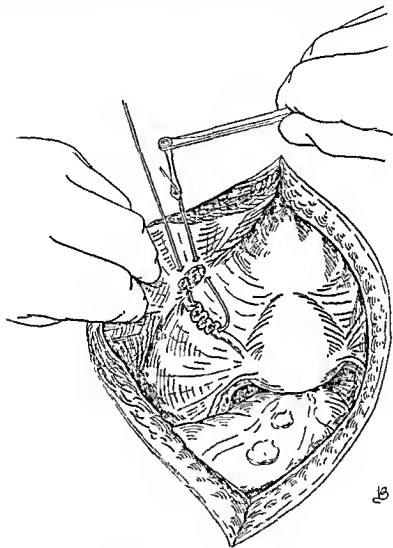


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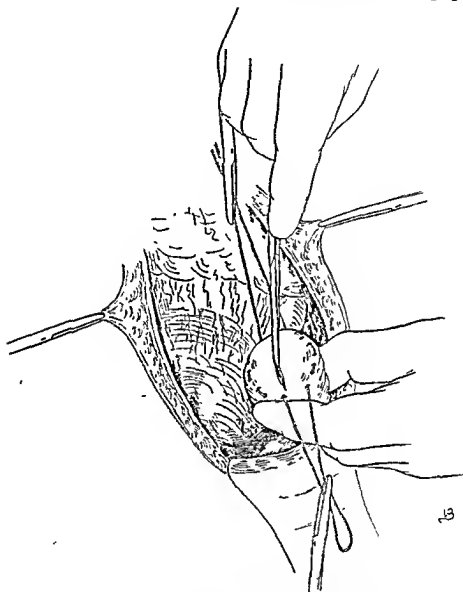


Fig. 557.—“Ideal” cholecystostomy: Opening the gall-bladder within the space demarcated by a circular invaginating suture.

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GALL-STONES COMPLICATING PELVIC DISEASE

If in the course of an operation for pelvic disease gall-stones are discovered, the surgeon has three alternatives: (1) to leave them *in situ*; (2) to remove the gall-bladder; and (3) to remove the stones only.

In favour of the first alternative, it may be noted that in many of the cases the gall-stones have been entirely unsuspected beforehand, having lain latent without any symptoms for many years. If left *in*

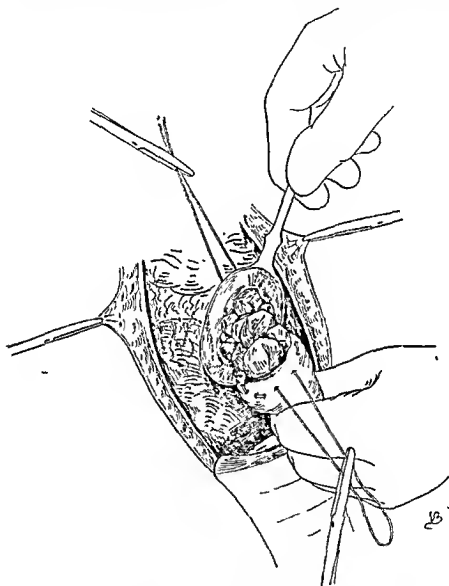


Fig. 558.—Emptying the stones from the gall-bladder.

situ they may continue to remain so, perhaps to the end of the patient's life but, on the other hand, their presence is a menace.

The second alternative involves a very great increase in the magnitude of the total operative procedure, and in our opinion such piling of Pelion upon Ossa is only to be entertained in exceptional cases.

The third alternative is that which we generally practise. It has the advantage that a second incision is not necessary, as the gall-bladder can be reached sufficiently by simply extending the mid-line incision upwards. It will be noted that we suture the gall-bladder without drainage—the

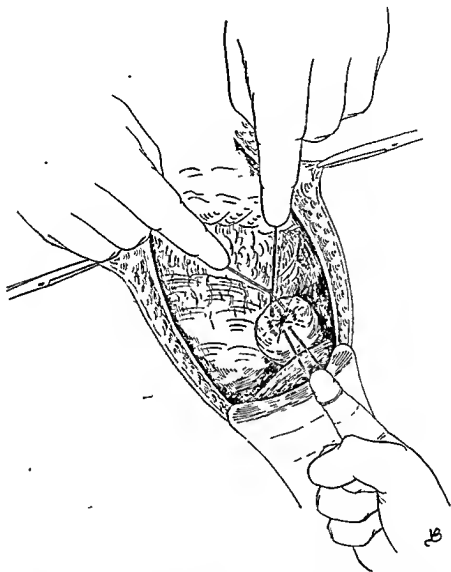


Fig. 559.—Closing the gall-bladder by tying the invaginating suture.

“ideal cholecystotomy” of Kocher. If a gall-bladder contains bile the cystic duct is patent and if there is no jaundice the common duct is unobstructed, so that where these conditions obtain the route of natural drainage is clear and artificial drainage is not necessary.

Recurrence of calculi after cholecystotomy occurs in 7 per cent. of the cases, but against this has to be set the far lesser severity of the

operation as compared with cholecystectomy—a matter of primary importance in the class of case we are now discussing.

Operation. i. The incision.—The sub-umbilical incision made for the pelvic operation is enlarged upwards to some 3 inches or more above the umbilicus. The pubic end of the incision may be sutured up if convenient.

ii. Inserting the invaginating suture.—The fundus of the gall-bladder having been exposed by packing off the intestines and stomach, a circular invaginating suture is inserted round the periphery of the fundus of the gall-bladder. The two free ends are held with a forceps and also the loop directly opposite so as to keep the gall-bladder steady and accessible.

iii. Incising and emptying the gall-bladder.—An incision is now made into the gall-bladder within the space demarcated by the invaginating suture (Fig. 557), and through it the gall-stones are squeezed out by manipulation (Fig. 558). The surgeon then introduces his index finger into the gall-bladder and makes sure no stones have been left behind. If any remain they are manipulated out or extracted with a scoop. When a quantity of "biliary dust" is present it is advisable to syringe out the gall-bladder with saline solution until it is quite clean.

iv. Closing the gall-bladder.—The invaginating suture is now tied, the assistant holding up the loop opposite to the knot with a finger as the suture closes, while with a forceps in his other hand he makes sure that the incision is completely buried. If the surgeon has any doubts of the security of the suture he should insert another one outside it and bury it in the same way (Fig. 559).

v. Closing the abdominal wound.—See p. 286.

Difficulties.—The operation is an easy one even in fat patients, since all that is required is access to the fundus of the gall-bladder. The cystic duct and common duct should be examined to make sure that they do not contain calculi.

Dressing and after-treatment.—See p. 24 and Chapter xxx.

CHAPTER XXVIII

ABDOMINO-VAGINAL EXCISION OF THE RECTUM

THE mass formed by a carcinoma of the rectum, or pelvic colon, is frequently mistaken for a tumour of the uterus or its appendages. A positive diagnosis may be obtained by the use of the sigmoidoscope, but this method of investigation may not be applied because of the entire absence of symptoms pointing to the bowel which characterizes some of these cases.

Growths in the upper part of the pelvic colon can, if removable, be treated by excision, either with end-to-end anastomosis or by fixing the two ends into the abdominal wound, while growths in the lower rectum can be dealt with by the perineal route. When, however, the growth affects the lower part of the pelvic colon, or the upper part of the rectum, neither of these procedures is applicable. When the bowel is exceptionally loose, the rectum can be mobilized by dividing its lateral ligaments, pulling it up, dividing its lower end, closing it and dropping it back and covering it with the peritoneum, while the colon above it is freed, excised with the growth, and its upper end fixed in the abdominal wound. Occasionally it is possible to pull the divided end of the colon into the open lumen of the rectum and fix it there by sutures after it has, so to speak, been intussuscepted. The best chance of effecting a permanent cure in most of these cases, however, lies in a combined operation of which the well-known procedures of abdomino-perineal and perineo-abdominal excision may be taken as types.

These operations, though severe ones, enable much more advanced growths to be dealt with than is possible by any other method. Adhesion to the sacrum, if not too extensive, can be overcome; adhesion or even fusion with the uterus can be treated by removing the latter organ with the segment of bowel, adhesions to the lateral pelvic wall can be separated, and enlarged glands, so long as they do not extend beyond the upper limit of the base of the pelvic colon, can be removed.

It is not within the scope of this book to describe all the various methods of excising the rectum, but we will describe an operation devised by one of us (V.B.), which has certain advantages. The technique of this operation follows in the main that of abdomino-perineal resection, as carried out by the late Ernest Miles, its foremost exponent. We desire to take this opportunity of acknowledging our great indebtedness to this brilliant and genial surgeon.*

The operation we describe differs from that of Ernest Miles, in that

* Victor Bonney, "Abdomino-Vaginal Excision of the Rectum," *Lancet*, March 22, 1924.

the bowel, instead of being withdrawn from the body through an incision in the perineum, is extracted through the vagina with the result that the patient escapes the shock associated with the extensive perineal wound. Moreover, in cases in which the growth is high up, our technique

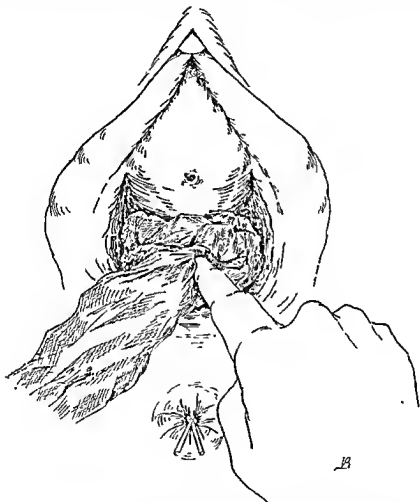


Fig. 560.—Abdomino-vaginal excision of the rectum: Packing the vagina with gauze.

enables the surgeon to remove the bowel without removing the anus, if he thinks fit. It has also a further advantage over abdomino-perineal resection, namely, that the bowel is withdrawn from the body before the peritoneum is sutured across the pelvis.

Like the abdomino-perineal operation, it is one that should not be performed if acute or subacute symptoms of obstruction are present, for the distended bowel gravely hampers the surgeon. In all such cases a preliminary colostomy should be performed and the bowel allowed to recover itself before the major operation is undertaken.

Preparation.—It is essential that the patient be thoroughly prepared for the operation by a course of saline aperients and enemata. In most cases some degree of obstruction is present, and the bowel above the growth is considerably distended and loaded with scybala, although abdominal examination may fail to reveal it.

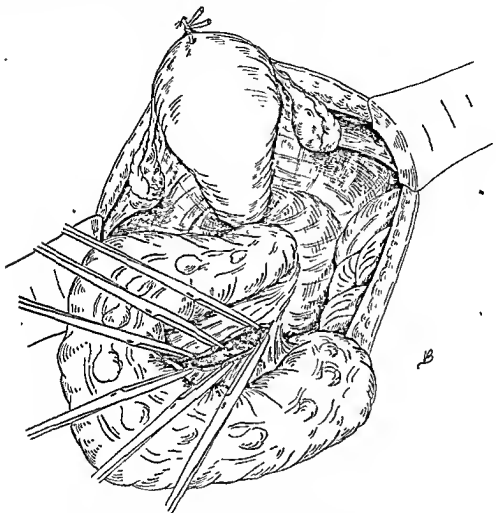


Fig. 561.—Dividing the mesocolon.

For at least a week beforehand, therefore, liquid paraffin and white mixture (mag. sulph. 3j, mag. carb. gr. v., aqua menth. pip. ad 3j) should be administered three times a day, so as to soften and bring away the fæces accumulated behind the stricture. An enema of simple saline solution should be given night and morning in addition, and on the day of the operation and some hours before it the lower bowel should be repeatedly washed out with saline solution through a long rectal tube until the fluid returns almost clear. An alternative, which should be preferred whenever much distension above the growth is apparent, is to perform preliminary colostomy and postpone the major operation until this is cleaned and working well.

Intestinal antiseptis.—Drugs greatly reducing the septicity of the bowel contents are now at the surgeon's service. The best of these is plthalsulphathiozol of which 3 5 to 7 grammes in divided doses should be given for 3 to 5 days before the operation with a low residue diet.

Position.—The lithotomy position is required for the first step in the operation; the Trendelenburg position for the abdominal stage;

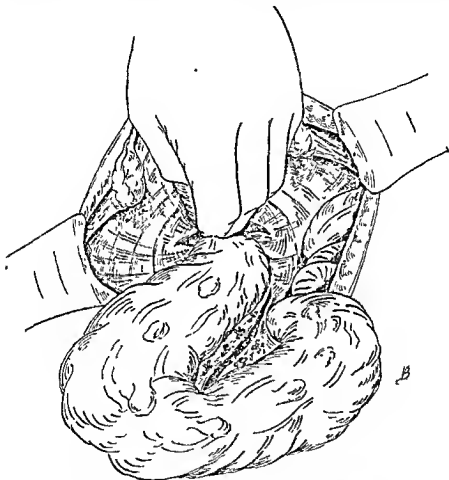


Fig. 562.—Separating the rectum from the vagina.

and for the final stage the patient is replaced in the lithotomy position.

Instruments.—The instruments described on p. 274, and, in addition, a large crushing clamp and four pairs of ring forceps will be required.

Operation. 1. Closing the anus and packing the vagina.—The patient is placed in the lithotomy position and the anus closed by a purse-string suture *very strongly inserted* so as to prevent the escape of the contents of the bowel during the manipulations involved in the operation. The

parts are then freely swabbed with Violet-green, and the vagina is packed with gauze soaked in the same, diluted to half strength (Fig. 560).

The object of the packing is twofold: firstly, to convert the vagina into a solid column and render its separation from the rectum and subsequent incision of the posterior vaginal wall easy; secondly, to sterilize the interior of the canal.



Fig. 563.—Separating the rectum from the sacrum.

ii. **Opening the abdominal cavity.**—The patient having been placed in the Trendelenburg position, an incision is made in the middle line extending from the pubes to the umbilicus, and the retractor is placed in position.

iii. **Packing back the intestines and suturing up the uterus.**—The intestines are now packed upwards to enable the operator to get a clear view of the pelvis. The uterus should then be pulled upwards and forwards, and its fundus strongly sutured to the lower angle of the abdominal wound. This device greatly increases the field of view.

iv. **Examination of the growth.**—The surgeon now proceeds to

examine the growth in order to determine whether its removal is advisable. A search must be made for enlarged hard glands or hepatic secondary growth. Carcinomatous glands lying between the layers of the pelvic mesocolon, or even at its base, can be removed, but if they are felt along the aorta the operation must be abandoned.

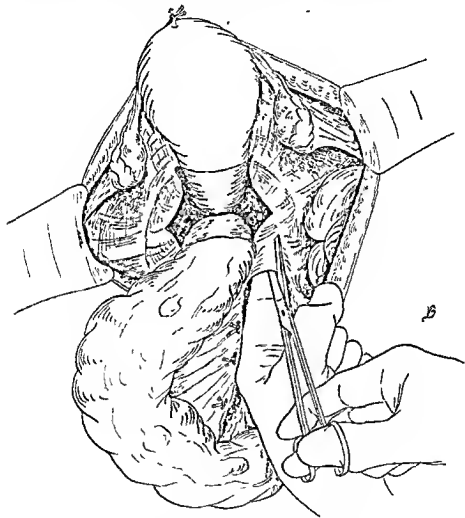


Fig. 564.—Dividing the peritoneum laterally.

v. Incision of the mesentery.—In this and the next succeeding steps we follow the admirable technique of Ernest Miles, the great point of which is that the bowel itself is not divided until it is entirely freed (Fig. 561). The advantage of this is that the surgeon can perceive, by its colour, that portion of the bowel to which the circulation has been entirely cut off: he can then make the line of division of the bowel lie in that part which has an unimpaired circulation. One of the most frequent

causes of death after abdomino-perineal excision, namely, necrosis of the bowel above the line of division, is thus obviated so far as possible.

The pelvic mesocolon having been freed, if necessary, and pulled up, a hole is made through it at a point corresponding to where the surgeon proposes presently to divide the bowel. The incision is carried downwards towards the root of the mesentery, each vessel as it spurts being

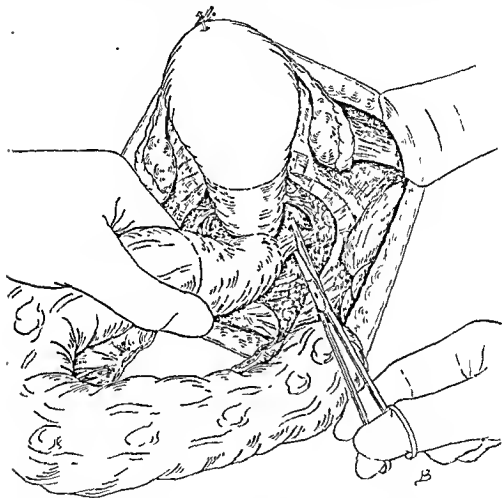


Fig. 565.—Dividing the lateral ligaments of the rectum.

seized with forceps. The vessel at the lowest level is the inferior mesenteric artery; this, if easily seen or felt, may be ligatured before it is cut. The vessels are then tied.

vi. *Separating the rectum from the vagina.*—The peritoneum at the bottom of the pouch of Douglas is now picked up with forceps and divided with scissors and, the plane of cleavage between the vagina and rectum being defined by the fingers, the two are separated in exactly the same way as described on p. 386 (Fig. 562).

vii. Separating the bowel from the sacrum.—The mesentery is now divided down to its very base and two fingers of the left hand are pushed down between the rectum and the face of the sacrum. The separation is easy except in cases in which the growth has already caused a morbid adhesion (Fig. 563).

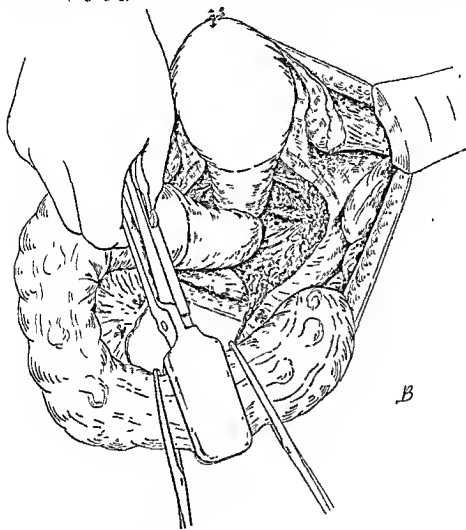


Fig. 566.—Crushing the colon.

viii. Dividing the peritoneum laterally.—The peritoneum lateral to the rectum on either side is now divided by scissors from behind forwards (Fig. 564).

ix. Dividing the lateral ligaments of the rectum.—The loosened bowel is now pulled upwards, thus making tense the lateral ligaments of the rectum, which are then divided with scissors down their whole length.

The bowel is now entirely free down to a point where it passes through the levator diaphragm (Fig. 565).

x. Division of the bowel.—The surgeon now inspects the bowel in the region where he has previously divided the mesentery, and, selecting a point well above the discoloration, which marks where the blood-supply has been cut off, applies a strong broad crushing clamp (Fig. 566).

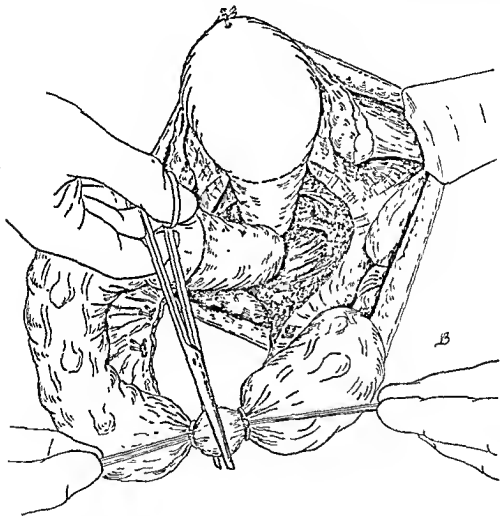


Fig. 567.—Dividing the colon.

Having applied the clamp, two narrow bowel clamps are applied on either side of it, to prevent any contents of the bowel finding their way into the crushed segment after the crushing clamp has been removed. The crushing clamp is now taken off and the crushed portion of the bowel is stoutly ligatured in two places, about an inch apart, after which the narrow bowel clamps are removed. The bowel is now divided between the two ligatures (Figs. 567, 568).

xi. Covering the bowel ends.—Each end of the bowel is now covered

with a piece of oil-silk which is tied on by a tight surround-ligature, according to the method of Miles.

xii. Incision of the posterior vaginal wall.—The upper end of the



Fig. 568.—Covering the ends of the colon with oiled silk.

bowel covered by oil-silk, which is subsequently going to be used for the colostomy, is now tucked away out of sight, and the posterior vaginal wall having been seized with a volsellum and tightly put upon the stretch, is incised in the middle line along its whole length, from the levator diaphragm upwards (Fig. 569).

xiii. Passing the guide ligature into the vagina.—The ends of the

ligature binding the oil-silk on to the lower cut end of the bowel, which have been left long for the purpose, are now passed into the vagina,

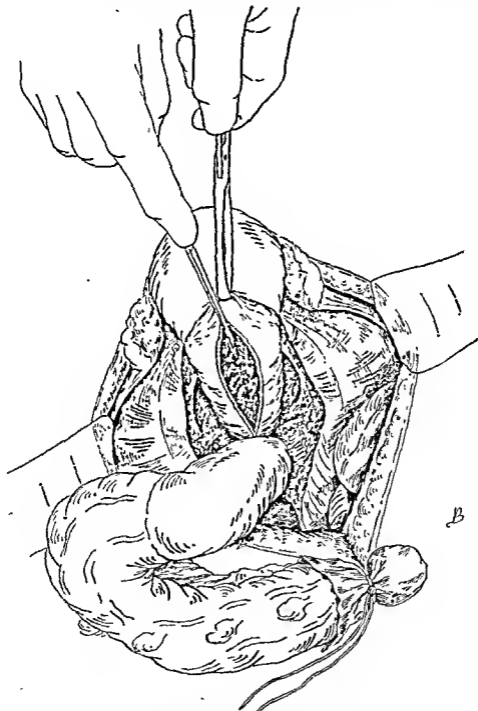


Fig. 569.—Splitting the posterior vaginal wall.

the gauze packing in which has been previously removed (Fig. 570).

xiv. Extracting the bowel.—An assistant with his hand between

the thighs of the patient now seizes the guide ligature and makes traction upon it, while the surgeon through the abdominal wound

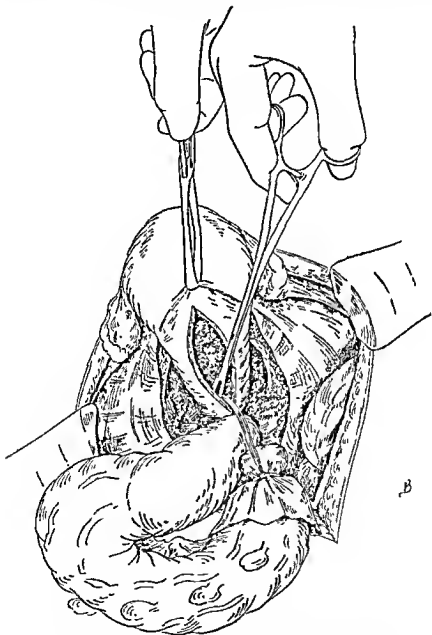


Fig. 570.—Passing the guide ligature down the vagina preparatory to withdrawing the bowel.

guides the bowel-end into the vagina. By continued traction and manipulation the entire length of the detached bowel is pulled through the vagina, so that it hangs free outside it.

xv. Closing the peritoneum over the pelvis.—The uterus having been freed from its temporary attachment to the lower angle of the abdominal wound, the peritoneum is now sutured together from before

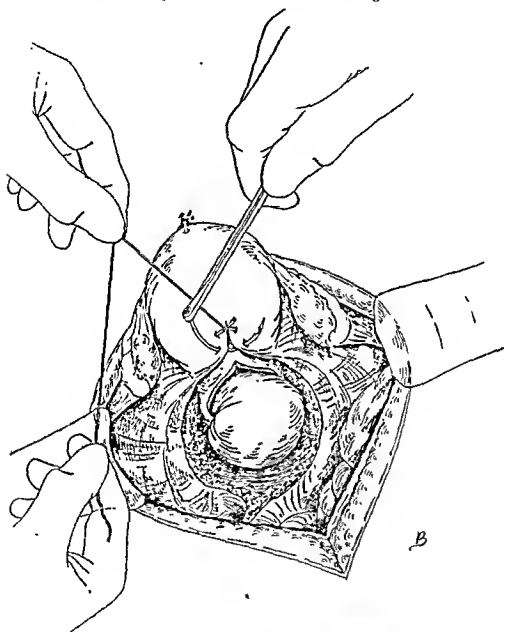


Fig. 571.—Closing the peritoneum over the pelvic cavity.

backwards, so as to form a roof to the pelvic cavity. Since the posterior part of the pelvis is practically empty, the peritoneal edges come together with great ease (Fig. 571).

xvi. The colostomy.—A small incision having been made through the outer side of the left rectus, the upper end of the divided bowel,

still covered with oil-silk, is pulled through it, and secured there by picking up the mesentery, and such further sutures picking up the bowel-wall as the surgeon may deem advisable (Fig. 572).

xvii. Closing the central abdominal wound.—This is closed in the usual way. A subcuticular suture should be used for the skin and the wound sealed with gauze soaked in collodion.

xviii. Removal of the bowel.—The patient having been replaced in

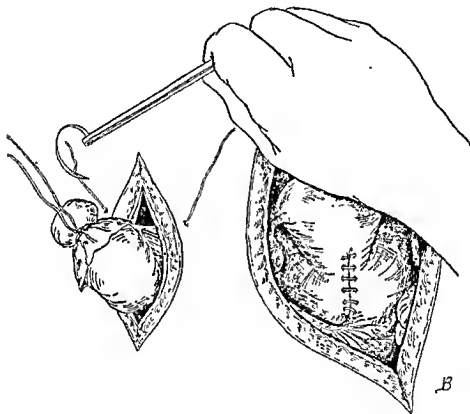


Fig. 572.—The upper end of the colon colostomized.

the lithotomy position, the subsequent steps of the operation will depend upon whether it is intended to leave the anus and lower inch of the bowel, or to remove the entire length, including the anus. There can be no doubt that the magnitude of the operation is much reduced by leaving the lower end. On the other hand, if the growth is low down, this lessening of the immediate risk of the operation is counterbalanced by an increased chance of recurrence.

xix. Removal with conservation of the lower end of the bowel.—The length of loose bowel hanging out from the vagina is carefully packed round with gauze soaked in 1-in-1,000 flavine, so as entirely to exclude everything but the bowel. Bowel clamps are now placed across the

bowel as far away from the growth as possible, and the bowel is divided between them (Fig. 573).

xx. Suture of the lower end of the bowel.—The lower cut end of the bowel is now closed by two layers of sutures, after which the clamp

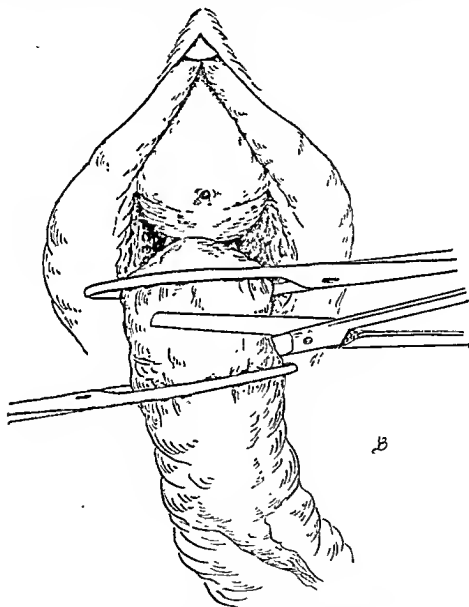


Fig. 573.—Dividing the bowel outside the vulva in cases in which the anus is not to be removed.

which remained on it is removed (Fig. 574). The end of the bowel is then pushed back into the pelvis through the incision in the posterior vaginal wall. About an inch of the rectum thus remains in the body of the patient, forming a short *cul-de-sac* closed up at its upper end.

xxi. Suture of the posterior vaginal wall.—The incision along the

still covered with oil-silk, is pulled through it, and secured there by picking up the mesentery, and such further sutures picking up the bowel-wall as the surgeon may deem advisable (Fig. 572).

xvii. Closing the central abdominal wound.—This is closed in the usual way. A subcuticular suture should be used for the skin and the wound sealed with gauze soaked in collodion.

xviii. Removal of the bowel.—The patient having been replaced in

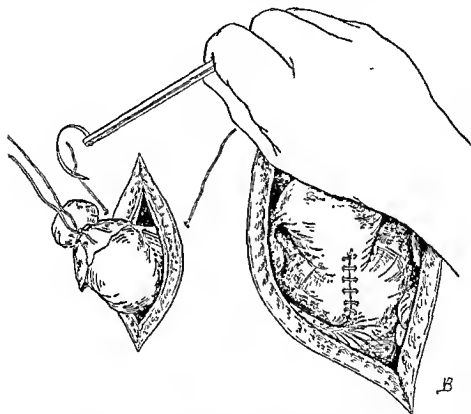


Fig. 572.—The upper end of the colon colostomized.

the lithotomy position, the subsequent steps of the operation will depend upon whether it is intended to leave the anus and lower inch of the bowel, or to remove the entire length, including the anus. There can be no doubt that the magnitude of the operation is much reduced by leaving the lower end. On the other hand, if the growth is low down, this lessening of the immediate risk of the operation is counter-balanced by an increased chance of recurrence.

xix. Removal with conservation of the lower end of the bowel.—The length of loose bowel hanging out from the vagina is carefully packed round with gauze soaked in 1-in-1,000 flavine, so as entirely to exclude everything but the bowel. Bowel clamps are now placed across the

on right round the anus in a circle. During the extension of the vaginal incision downwards, the bowel should be held forwards by an assistant (Fig. 576).

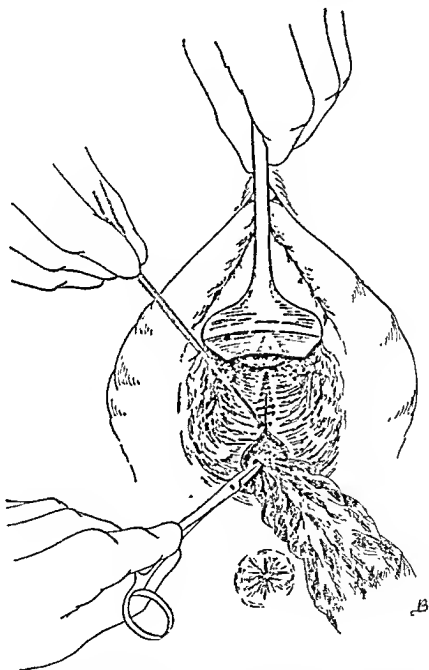


Fig. 575.—Packing the pelvic cavity with gauze after suturing the vagina.

xxiii. Dividing the lower attachments of the bowel.—The incision just described is now deepened all round the lower end of the pelvic diaphragm, first the superficial fat and fasciæ and finally the pelvic diaphragm,

length of the posterior vaginal wall is now closed with a catgut suture, except for about an inch at its lower end. Through this gap gauze soaked in 1-in-1,000 flavine is packed into the pelvis, after which the

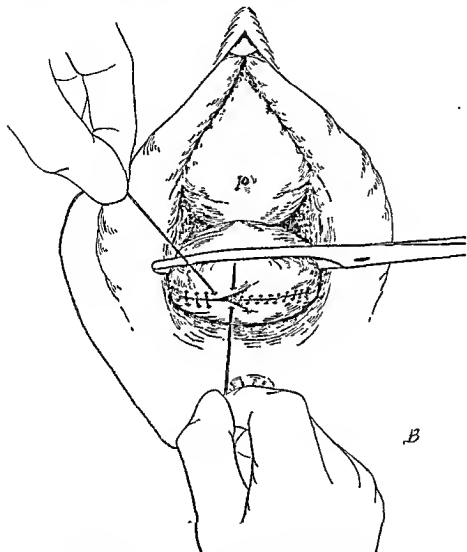


Fig. 574.—Suture of the lower end of the bowel.

purse-string suture in the anus is removed, and a small piece of tubing is inserted to drain the anal *cul-de-sac* (Fig. 575).

xxii. Removal of the entire bowel.—If it is decided to remove the entire length of the bowel, including the anus, the incision in the posterior vaginal wall should be extended downwards to the orifice of the vagina and then carried backwards along the perineal skin until the anal rugæ are reached, from which point the incision is carried

on right round the anus in a circle. During the extension of the vaginal incision downwards, the bowel should be held forwards by an assistant (Fig. 576).

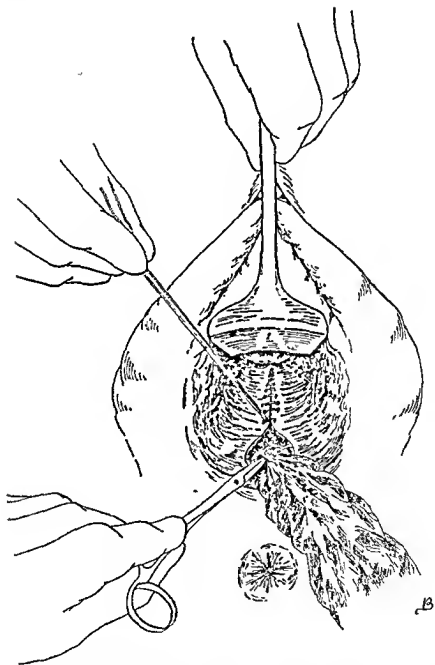


Fig. 575.—Packing the pelvic cavity with gauze after suturing the vagina.

xxiii. Dividing the lower attachments of the bowel.—The incision just described is now deepened all round the lower end of the bowel, dividing first the superficial fat and fasciæ and finally the pelvic diaphragm,

at the point where the bowel penetrates it. Care must be taken during this step of the operation not to open the bowel (Fig. 577).

xxiv. Suture of the vagina and perineal wound.—A good many vessels will require a ligature where the bowel has been detached from the pelvic diaphragm and superficial fat and fasciæ. These vessels being

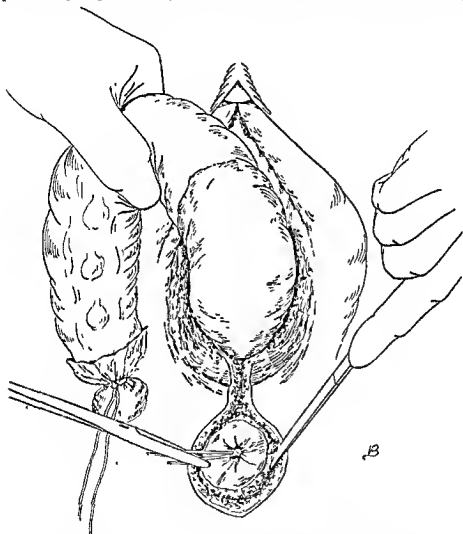


Fig. 576.—Alternative method: Removing the entire bowel: Incision round the anus.

effectively secured, the incision in the posterior vaginal wall is closed from above downwards with a continuous catgut suture until the orifice of the vagina is reached. The perineal and peri-anal wound is then closed by deep interrupted sutures of stout silkworm-gut, a gap being left in its posterior end through which gauze soaked in 1-in-500 flavine is packed into the posterior half of the pelvis (Fig. 578).

After-treatment.—The operation is a severe one and there is often considerable shock, most notably in those cases in which the entire

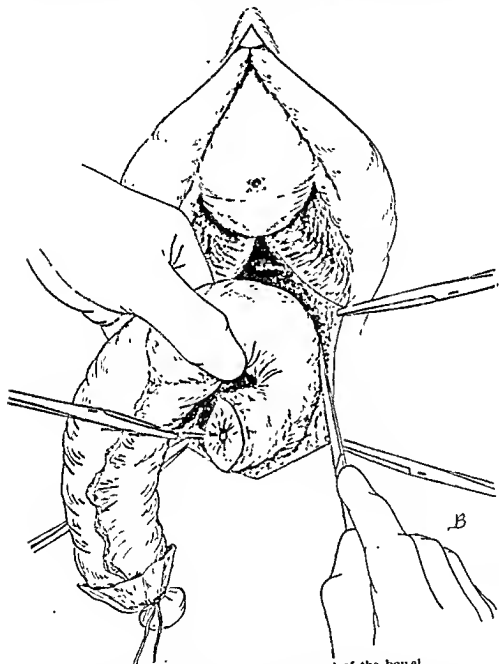


Fig. 577.—Dissecting out the lower end of the bowel.

length of the bowel is removed. The treatment of shock is discussed on pp. 832-837. An immediate infusion of blood into a vein is the most generally useful treatment. The flanne gauze should certainly not be removed for 48 hours and may be left a day or two longer than this, if the condition of the patient is satisfactory.

The opening of the colostomy need not be proceeded with for several days if the abdomen is not distended. If, however, distension is present, the bowel must be opened sooner. An anæsthetic is not necessary to open the bowel.

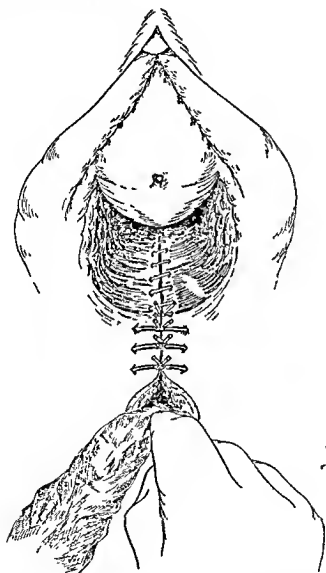


Fig. 578.—The vagina and skin sutured and pelvic cavity packed with gauze.

The stitches in the perineal and peri-anal wound should be left for 10 days. If a tube has been placed in the anus, it should not be touched for 4 or 5 days, after which it may be progressively shortened. The large cavity left after removal of the flanne gauze takes a considerable time to granulate up and invariably becomes more or less septic. In

these circumstances it should be irrigated through a large catheter with 1-in-1,000 flavine solution, at a low pressure.

Convalescence is usually slow, and the patient will probably not be able to get out of bed until the 4th week.

Difficulties and dangers.—If the vagina is a narrow one removal by this route is contra-indicated. The operation is one that should not be attempted except by one expert in abdomino-pelvic surgery. The immediate danger is shock from the extensive extirpation. There is not usually any great loss of blood, for the only large vessel, the inferior mesenteric artery, is secured at the outset. Spinal anæsthesia is very advantageously combined with general anæsthesia in these cases.

The ureter on the left side is in some danger of being injured in the earlier part of the operation, especially if the sigmoid mesentery is short. Its position should be felt or, if necessary, the duct exposed.

On opening the abdomen, the surgeon may find that the sigmoid mesentery is so short that the bowel cannot be raised out of the wound. Such a condition, if unaltered, would result in dangerous tension upon the colostomy whereby the bowel-end might be pulled into the abdomen. Further, the tension in the mesentery may interfere with the blood-supply to the bowel so that it undergoes necrosis.

Before proceeding, therefore, to the division of the bowel, he should mobilize it by dividing the peritoneum covering the left side of the base of the mesentery along a line parallel to the bowel.

Experience has shown that one cause of death after abdomino-perineal excision of the rectum is necrosis of the bowel above the colostomy opening. This has been attributed to faulty choosing of the point for the division of the mesentery, whereby all the three sigmoidal vessels are cut off from the bowel. Due care should therefore be taken to see that the circulation through one at least of these vessels is preserved intact. Necrosis of the bowel is sometimes due to excessive tension on the mesentery by reason of its shortness, and we, therefore, urge the importance of free mobilization in the manner described above.

Septic infection of the operation area is, even more than shock, the most serious danger of the operation. Such infection proceeds from the bowel-ends or from the anus, and is the reason why absolute closure of the bowel, after division in the manner already described, is so important. Similarly, the closure of the anus by tying a purse-string suture round it is very important, and in cases in which it is intended to remove the entire length of the bowel, additional security will be obtained by tying a ligature of strong tape round the anus after it has been dissected free, for if the contents of the bowel escape and soil the peri-anal area, the great cavity left after the extirpation will inevitably become gravely infected by faecal organisms. The tendency for the contents of the bowel to be forced through the anus is very great, and the purse-string suture must be strong and applied

deeply. The success of the operation depends chiefly on absolute exclusion of the possibility of sepsis of faecal origin.

Alternative technique.—It may be preferable to begin the operation by completely separating the vagina from the rectum below, as described under colpo-perineorrhaphy (p. 514) and then splitting the former throughout its whole length and opening the pouch of Douglas. This should always be done when perineo-abdominal, instead of abdomino-perineal, excision is performed on a woman.

PERINEO-ABDOMINAL EXCISION OF THE RECTUM

This is a better operation than either abdomino-perineal or abdomino-vaginal excision when the growth is relatively low down (and particularly than the latter, when the vagina is narrow), for in our experience it produces less shock than either of them. The technique now to be described has the advantage of shortening the operation considerably.

Preparation.—The same as for abdomino-vaginal excision (*see* p. 749). Spinal anaesthesia should be combined with inhalation or intravenous anaesthesia.

Position.—The Trendelenburg position is required for the first steps, the lithotomy position for the perineal stage, while for the final steps the patient is replaced in the Trendelenburg position.

Instruments.—The same as those for abdomino-vaginal excision (*see* p. 750).

Operation. i. **Opening the abdominal cavity.**—The incision should be through the centre of the left rectus, extending from about one inch below the level of the umbilicus to an inch above the line of the groin.

ii. **Exploring.**—The surgeon now proceeds to explore the pelvis to ascertain the exact limits of the growth. The glands in the meso-colon are now palpated and finally the omentum and liver to exclude secondary growth in these situations.

iii. **Mobilizing the colon.**—The outer leaf of the meso-colon is now divided parallel to the line of the bowel until it is thoroughly mobilized, care being taken not to damage the mesenteric vessels (*Fig. 579*).

iv. **Temporary closure of the abdominal wound.**—By a series of through and through gut sutures the wound is now temporarily closed.

v. **Closing the anus.**—The patient having been placed in the lithotomy position, the anus is closed by a purse-string suture, after

which the whole of the peri-anal skin with its underlying fat is freed by a circular incision, and a piece of thin tape tied round it tightly, so as

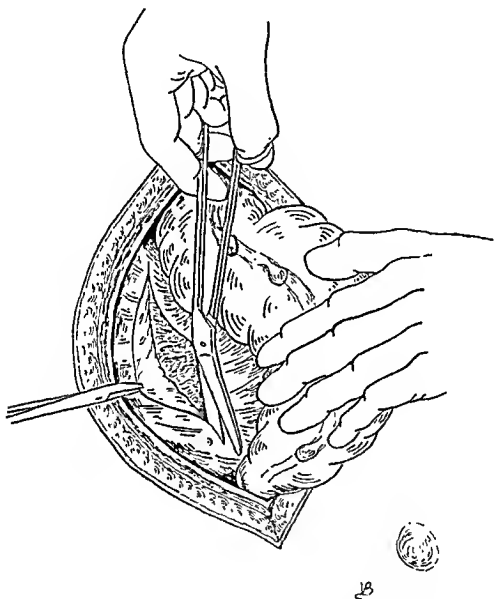


Fig. 579.—Perineo-abdominal excision of the rectum—Dividing the outer leaf of the meso-colon.

to render escape of the bowel-contents during the subsequent steps of the operation impossible.

vi. Separating and splitting the posterior vaginal wall and opening Douglas's pouch.—The posterior vaginal wall is now separated from the rectum in exactly the same manner as described and figured

on pp. 514-517; and split in the middle line in the manner shown in Fig. 580. The incision should be continued up to the cervix when it will be found that the scissors have opened Douglas's pouch.

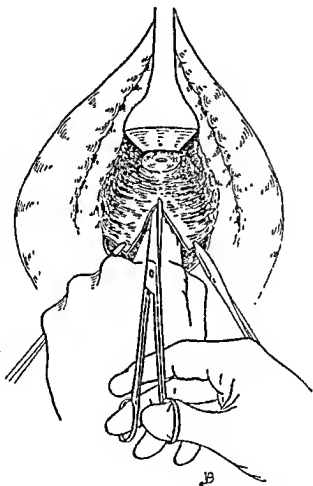


Fig. 580.—Splitting the posterior vaginal wall.

vii. Separating the rectum posteriorly.—The midline split in the posterior vaginal wall is now joined to the incision circumscribing the anus by an incision through the perineal skin as shown in Fig. 576. The circumscribing incision is now deepened behind until the firm attachment of muscle and fascia to the sacro-coccygeal junction is divided. When this is done an uninterrupted plane of cleavage between the face of the sacrum and the posterior aspect of the bowel is entered on, along which a couple of fingers can be passed as high as the sacral promontory (Fig. 581).

viii. Enlarging the opening into Douglas's pouch.—The index finger of either hand is now passed into the peritoneal cavity, and the opening previously made into Douglas's pouch is strongly stretched

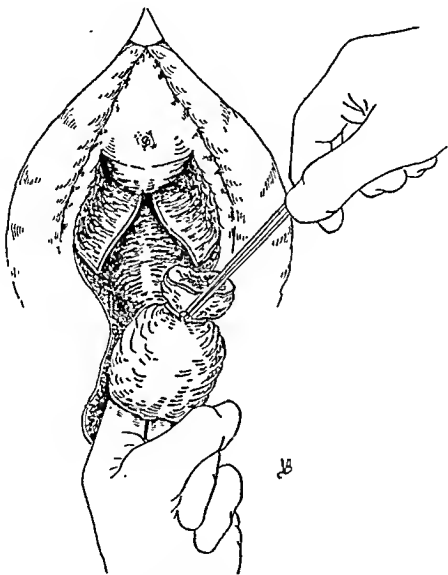


Fig. 581.—Separating the rectum behind.

laterally, so as to push well to the sides the tissues in which the ureters are running (Fig. 582).

ix. Dividing the lateral ligaments.—The rectum is now free except for its lateral attachments, which can be felt as a thin firm plane of tissue on each side. These lateral ligaments are now divided with

scissors, keeping the blades fairly close to the bowel wall, but sufficiently outside it to be clear of the growth (Fig. 583).

x. Antisepticing the freed tissue.—This is an important step, because presently the freed rectum is going to be pulled up through the

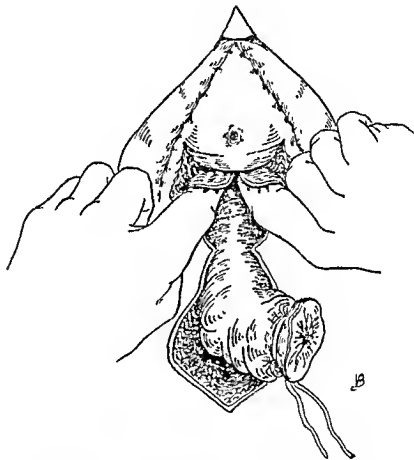


Fig. 582.—Stretching the opening into Douglas's pouch.

abdominal cavity. Very thorough soaking with Violet-green should be employed.

xi. Suturing the vaginal wall and perineal skin.—All bleeding vessels having been secured and the freed rectum pushed into the pelvis as high as possible, the posterior vaginal wall is repaired by a continuous catgut suture and the edges of the perineal skin and the tissues deep to it are brought together by deep interrupted gut sutures (Fig. 584).

xii. Pulling the bowel out of the abdominal cavity.—The patient having been replaced in the Trendelenburg position and the

temporary sutures holding the abdominal wound having been removed, the surgeon passes his left hand into the pelvis and, grasping the end of the freed bowel, pulls it out through the abdominal wound and as

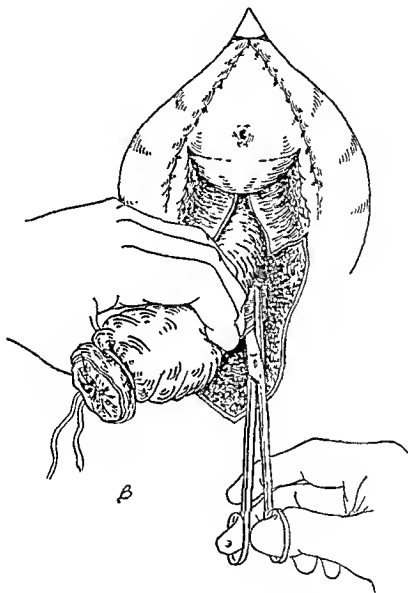


Fig. 583.—Dividing the lateral rectal ligaments.

the lower part of the mesocolon (where it is opening out to become continuous with the peritoneum covering the floor of the pelvis) comes tensely into view he divides it with scissors until a long length of bowel is entirely mobilized (Fig. 585) Such vessels as have to be divided are

picked up and tied, and if enlarged glands are felt they must be brought away with that part of the mesentery which is removed.

xiii. Dividing the bowel.—The freed length of bowel should now be inspected, particular attention being paid to its colour which is

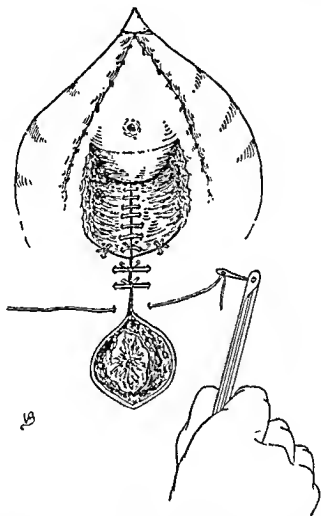


Fig. 584.—Suture of the posterior vaginal wall and perineum.

markedly different over that length from which the blood supply has been cut off from that portion where it is uninterfered with. The division must be made in the uninterfered-with (normally coloured) area and is effected by crushing and ligaturing as is illustrated in Figs. 566-567.

xiv. Fixing the proximal end of the colon in the wound.—The proximal end of the colon, still ligatured, is now fixed in the upper

end of the abdominal wound, after which the rest of the wound is closed in the usual way, interrupted silkworm or nylon gut sutures being used for the skin.

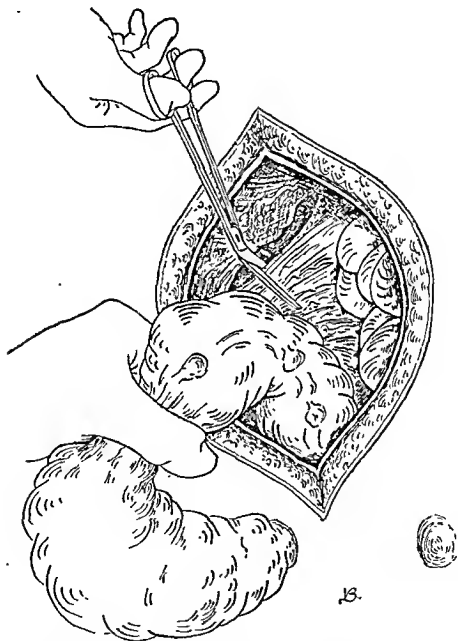


Fig. 585.—Pulling out the separated bowel and dividing the mesocolon.

xv. Packing the cavity left with flavine gauze.—It will be noted that in this technique the peritoneum at the bottom of the pelvis is not sutured, so that an aperture remains connecting the peritoneal

cavity with the extirpation cavity. This might be held to be a serious drawback but it should be remembered that, in the usual technique of vaginal hysterectomy an opening is left connecting the peritoneal cavity with the vagina without any ill results. The omission of this step is a great saving in time and that is why it is here adopted. Instead the extirpation cavity should be packed from below with gauze soaked in 1-in-500 flavine.

After-treatment.—The colostomy should not be opened until beginning distension and discomfort indicate it. The gauze-packing should be withdrawn in 5 or 6 days.

Difficulties and dangers.—In general those attaching to abdomino vaginal excision, the differences of the two procedures being borne in mind (*see p. 767*).

SYNCHRONISED COMBINED EXCISION OF THE RECTUM

Of quite recent years Naunton Morgan and Lloyd-Davies have developed a technique whereby two operators work simultaneously from the abdomen and perineum respectively—a great saving of time is thereby effected. For its performance two experts are required and it is an advantage to have an operating table with apparatus to hold the half flexed thighs apart while the legs, flexed at right angles to the thighs, support the patient in the tilted position. The technique may be described as a mixture of those respectively, employed in abdomino-perineal and perineo-abdominal excision of the rectum.

CHAPTER XXIX

OPERATION-WOUNDS OF THE BLADDER, URETER, AND BOWEL

WOUNDS OF THE BLADDER

DURING operations on the pelvic organs, and more particularly those having for their object the removal of the uterus, the bladder may be wounded.

Wounds of the bladder may be divided into three classes :

1. The peritoneal covering only is injured.
2. The muscular coat is injured.
3. All the coats are injured and the bladder is opened.

1. **Peritoneal injury.**—The cut edges of the peritoneum should be approximated with a continuous Lembert's suture of No. 1 catgut.

2. **Muscular injury.**—The divided muscles should be united with a continuous suture of No. 1 20-day catgut, and the peritoneal wound then closed with a continuous Lembert's suture of the same material.

3. **The bladder is opened.**—The mucous membrane should first be united with a continuous suture of No. 0 plain catgut. The muscular coat should then be united by interrupted sutures of No. 1 catgut, and, lastly, the peritoneum closed with a continuous Lembert's suture of catgut or No. 2 silk. In some cases of total hysterectomy the bladder may be wounded below the point of peritoneal reflection. Very often in these circumstances the bladder-wall is so thin that tier sutures are impracticable. In such a case a good result may be obtained by suturing the upper edge of the wound in the bladder to the cut lower edge and the edge of the anterior vaginal wall inclusively.

After-treatment.—If the bladder has been opened a catheter should be stitched in and left *in situ* for 10 days or more, during which time a water-suction apparatus should be continuously applied. Urotropin, 5 grains three times a day, should be given by the mouth.

If the urine becomes alkaline and purulent, acid sodium phosphate or ammonium benzoate should be given in addition to the urinary antiseptic mentioned.

WOUNDS OF THE URETER

Uretero-vesical anastomosis.—During some operations on the uterus, or broad ligament, the ureter may be cut, or may subsequently slough, or a piece of it may have to be excised on account of malignant disease implicating it. One method of treating a divided ureter is by implanting its upper end into the bladder.

Cases of ureteric fistula due to extensive lacerations during childbirth must also be treated in this way.

It is all-important to leave intact the blood-supply to the ureter derived from the peritoneal vessels. No more loose end of the ureter free of peritoneal attachment should therefore be utilized for the implantation than is necessary to ensure a union without tension.

The implantation having been performed, the cut peritoneal edge of the posterior layer of the broad ligament should be sutured to the bladder inside the point of anastomosis. By this means the ureter is left covered over entirely by peritoneum, and a denuded portion is

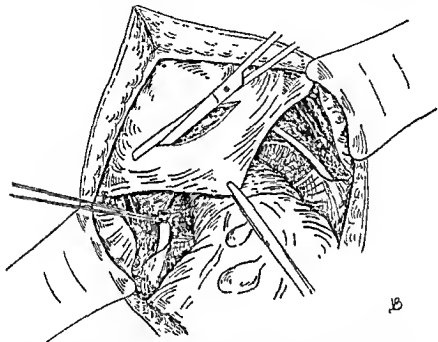


Fig. 586.—Uretero-vesical Implantation: Opening the bladder.

not running unsupported across the pelvis like a clothes-line. The method about to be described accomplishes this object.

i. *Preparation of the ureter.*—The proximal cut end of the ureter is ligated with No. 4 silk, the ends of the ligature being left long to act as a guide. If the distal end of the cut ureter can be seen, it also should be ligated and the suture cut short.

ii. *Preparation of the bladder.*—To relieve tension it may be necessary to mobilize the bladder by separating it off the symphysis or dividing its lateral attachments. An opening is now made into it through its peritoneal surface (Fig. 586), and, the index finger having been inserted, a second small opening, only just large enough to pass the ureter through, is made above the original uretero-vesical junction. The surgeon choosing that portion of the bladder which, with a finger inside it can

be pushed furthest upwards, i.e., towards the ureteral end. This should be effected by cutting down on the tip of a fine-pointed curved pressure forceps passed in through the opening already made. This new opening is probably through the portion of the vesical wall not covered with peritoneum, and the best of all instruments to use is a short-jawed nasal

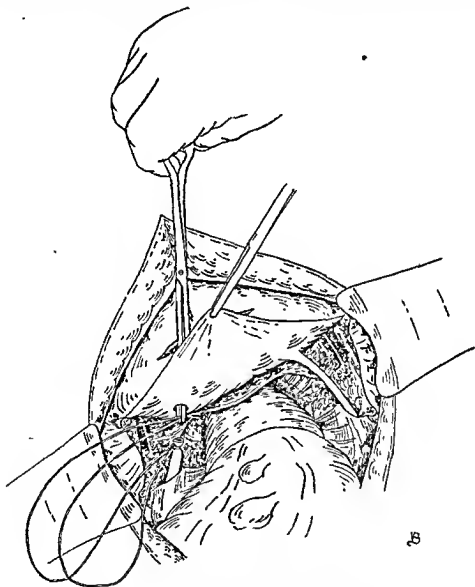


Fig. 587.—Pulling the ureter into the bladder.

polypus-forceps because it does not stretch the aperture when the blades are opened.

iii. Implanting the ureter.—The proximal end of the cut ureter is now pulled into the bladder by pushing the forceps through the hole made and drawing the guide-ligature through the lower opening and out through the upper opening (Fig. 587).

iv. **Ensheathing the new uretero-vesical junction.**—The cut edge of the lateral pelvic peritoneum to which the ureter is adherent is now sutured to the cut edge of the peritoneum covering the bladder, and below this directly to the vesical wall. With a little ingenuity a complete sheath for the ureter at its new junction with the bladder can be effected (Fig. 588).

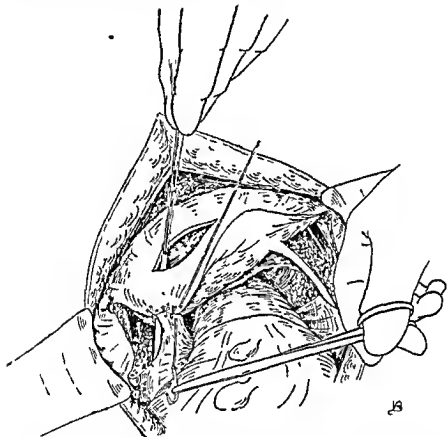


Fig. 588.—Attaching the ureter to the external surface of the bladder.

v. **Anchoring the ureter.**—The ureter projecting into the bladder is now prevented from retracting by No. 0 catgut sutures inserted through the wall of the ureter and bladder at the point where the ureter enters the bladder (Fig. 589).

The ureter is now finally anchored as follows. The guide-ligature being removed, the end of the ureter is trimmed as if cutting a quill pen. A No. 0 20-day catgut suture is tied into its wall, near the point of the quill, and the two long ends of this suture are then passed through the bladder-wall about 1 inch from the point where the ureter enters the bladder. When the ends are tied they anchor the ureter very firmly. If the ureter and bladder come together easily the ureter may be overfolded by the bladder-wall in the same manner as the catheter

in jejunostomy, but in many cases this is not possible without putting dangerous traction on the parts.

vi. Closure of the upper opening in the bladder.—The upper opening in the bladder is closed by tier sutures in the manner described at p. 777.

vii. Burying the anchoring suture.—The anchoring-suture, where it shows on the outer surface of the bladder, is now buried by two or three sutures of fine catgut.

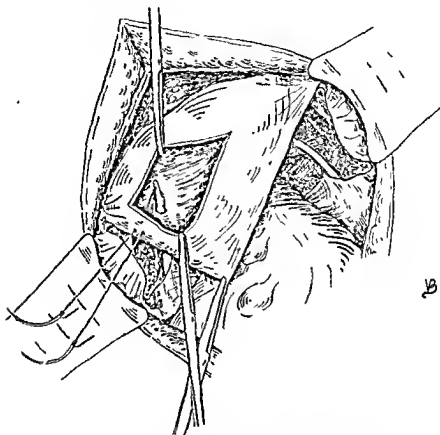


Fig. 589.—Anchoring the ureter inside the bladder.

viii. Insertion of catheter.—A catheter is now fixed into the bladder by a suture at the meatus for 10 days and water-suction applied.

ix. Alternative method.—Instead of the above technique, that described under uretero-colic implantation can be employed. This does well when the bladder and ureteral end meet without tension on the ureter, but it has two disadvantages. Firstly, it is difficult to make the hole in the bladder of the exact size to just admit the ureter, and secondly that it is more difficult to pass the needles carrying the fixation sutures through the bladder wall when the viscus is empty, the needle points being apt to catch in the mucosa.

Difficulties.—The smallness of the ureter and the difficulty of getting access to the posterior wall of the bladder.

If the ureter does not readily meet the bladder the latter can be mobilized by separating it from the symphysis and, if necessary, dividing the lateral ligament on that side.

Dangers.—(1) The junction may not remain water-tight, and (2) the implanted end of the ureter may slough. The first of these dangers is not likely to arise if the operation is carefully carried out. The second danger is a very definite one, and is due to the fact that one channel of blood-supply to the ureter is cut off by the section of the ureter. If it occurs, the urine will escape by the vagina if the end of that canal is open, as it is in the condition in which uretero-vesical implantation is most often required, viz., Wertheim's operation. In the absence of an open vagina a tube should be inserted through the abdominal wound down to the junction.

Sloughing of the new junction is invariably accompanied by pyelitis, with considerable fever and constitutional disturbance.

Uretero-ureteral anastomosis.—When the ureter is divided high up in its course, i.e. above the pelvis, it may be necessary to perform an anastomosis of the cut ends. There are various methods of doing this, the best-known being that in which the upper end is enlarged by splitting and the lower end is drawn into it by traction on two guide-sutures and then fixed by other sutures, closing the split previously made. When the ureter is dilated this may be fairly easy, but in the natural state of the conduit it is difficult, and the upper end should be dilated before splitting it. Whenever it is possible to pull down the upper end sufficiently to effect implantation into the bladder, this course is to be preferred.

Uretero-colic anastomosis.—When the ureter has been divided too high up to implant it into the bladder, or when such implantation has failed, the ureter must be implanted into the pelvic colon in the manner already described at p. 165, as also they should be if both ureters are cut.

Ligation of the ureter.—The accidentally cut ureter has been treated by simply tying a ligature round it. In fortunate cases the kidney, after undergoing acute dilatation, ceases to function, atrophies and causes no further trouble. If, however, the urine is already infected, or becomes infected, violent pyelitis leading up to pyonephrosis is the result. It is a method of treatment only justifiable in circumstances of extreme urgency.

Nephrectomy.—A divided ureter can be treated by immediate nephrectomy but this is inadvisable as a rule. It is, however, clearly indicated in certain cases of ureteral fistula in which, as the result of prolonged suppurative pyelitis, the kidney has become disorganized.

WOUNDS OF THE BOWEL

During an operation upon the genital organs the bowel may be injured. It may be injured during the primary incision when opening

the abdominal cavity, if sufficient care is not taken when incising the peritonæum; the rectum may be incised when removing the body of the uterus in total hysterectomy, and more particularly in a radical total hysterectomy, if care is not taken to place a swab behind the vagina; while various parts of the intestine, and the colon especially, may be wounded during the separation of adhesions.

Wounds of the intestine are of four degrees:

1. The peritoneal coat only may be injured.
2. The peritoneal and muscular coats are divided.
3. The howel is opened.
4. The howel is torn across.

The wound may be clean cut, or, in the case of the peritoneum, a portion of this tissue of varying size may be torn off when separating the bowel from some other structure to which it has become adherent.

Treatment.—1. If only the peritoneal coat is injured, the cut peritoneal edges should be carefully sutured with a continuous No. 2 silk or No. 0 catgut on a Souttar's needle.

If a piece of peritoneum is torn off owing to the separation of a dense adhesion, it may be difficult to approximate the torn edges of the peritoneum on account of its thickened and rigid condition, due to the adhesion. In this case it will be necessary to obliterate the raw and often hadly oozing surface by a series of interrupted sutures. These, on account of the friable nature of the tissue, will be found readily to tear out, so that great care must be taken in their application, and it is better to use a somewhat thicker suture, as being less liable to this accident. Also, the suture must be passed somewhat deeper than the peritoneum to get a good hold of the tissues. It may happen that the surface of howel denuded of peritoneum is so large that if the interrupted sutures were applied the lumen would be dangerously narrowed; in which case either the raw surface must be left uncovered or perhaps a piece of omentum can be stitched over it.

2. If the muscular coat of the bowel is wounded, the cut edges of the muscle may be approximated by a continuous suture, after which the peritoneal coat is closed in a similar manner. The most difficult cases are those in which a large piece of the muscle coat has been torn entirely away, exposing the mucous coat through the deficiency. If let alone, the latter will almost certainly slough, with resulting death from peritonitis, or at the best a very troublesome faecal fistula. This accident is most commonly incurred during the separation of a densely adherent pus tube, and the bowel wounded is usually the pelvic colon.

An attempt to pull the muscle-edges together will almost certainly fail, for the bowel-wall in these cases is thickened and very friable, and the tension on the sutures causes them to cut out.

The surgeon faced with this difficulty must proceed in one of the following ways:

i. He may attach the bowel to the anterior abdominal wall by means of a circular suture, which alternately picks up the bowel-wall and the parietes. The suture must be tightened up only just enough to approximate the bowel closely to the parietal peritoneum; for if it is pulled upon too hard the suture will either cut out or the bowel become dangerously constricted (Fig. 590, A).

ii. By a similar suture the damaged intestine may be brought into apposition with a neighbouring coil of gut. This may be preferable to the first method if the damaged coil is so tethered down by inflammatory thickening as to make it difficult to bring it up to the parietes.

iii. The uterus may be made to stop up the hole, a circular suture being made use of in the way already described.

iv. A piece of omentum may be sutured over the damaged area. This is not so good a method if the seat of the bowel injury is in the pelvis, as it usually is, for the attached omentum is very likely to exercise injurious traction on the transverse colon.

3. If the injury extends through the mucous coat and the intestine is opened, the course to be pursued depends on the circumstances. If possible, the opening should be closed by tier sutures, one each for the mucous, muscular and peritoneal coats.

If there is an actual deficiency in the bowel-wall, or if it is greatly thickened by inflammatory exudation, closure of the hole may be impossible. This is a very serious state of affairs, the segment of bowel involved being usually the pelvic colon or rectum, the first of which in these cases can rarely, and the latter never, be brought up to the surface, so that a colostomy at the site of injury is generally impossible. One of the following procedures will have to be tried:

i. The uterus or a neighbouring piece of bowel can be used to block the gap in the manner already described for wounds not perforating the mucous coat.

If either of these is done, a temporary colostomy, well above the seat of injury, should be effected, so as to keep the sutured points at absolute rest, and prevent the escape of faecal matter into the peritoneal cavity.

ii. In certain extremely difficult and exceptional cases in which blockage of the hole is absolutely impossible, because it is inaccessible, as occasionally may occur when the wound is right at the bottom of Douglas's pouch, the top of the uterus and the upper edges of the broad ligaments should be sutured to the posterior half of the pelvic brim, so as to exclude the pelvic from the general peritoneal cavity. Before this is done, the vagina should be opened and a tube passed into it, so that the contents of the leaking bowel may find a ready exit. Colostomy in addition, if the patient's condition will admit of it, will minimize the violent pelvic inflammation which necessarily follows, and allow the recto-vaginal fistula to close sooner (Fig. 590, C).

iii. An alternative to the foregoing methods is to pass a tube of large calibre down to the deficiency of the bowel-wall, and then suture around it the adjacent coils of small intestine so as to form an enclosed

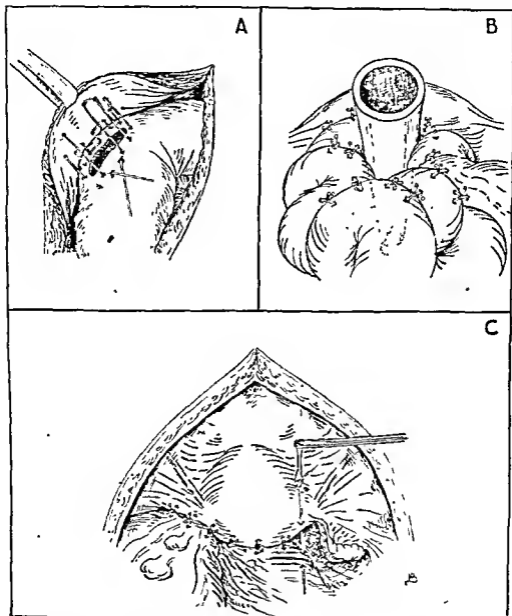


Fig. 590.—Methods of dealing with uncloseable holes in the rectum and pelvic colon: (see text).

track down which the tube passes. These sutures must be carried right up to the anterior abdominal wall and the omentum should also be sutured so as to form a sort of screen cutting off the region of damage from the rest of the peritoneal cavity. A colostomy should then be

performed. We have done this successfully on several occasions (Fig. 590, B).

4. If the bowel is torn quite across and it happens to be the small intestine, immediate anastomosis will be possible, with or without resection of part of the gut, and the same obtains if the accident happens to a piece of large intestine which is mobile. In the case of the large intestine, however, this is most unlikely, for in all probability it will be densely bound down in the pelvis and immediate union is out of the question. In such circumstances one of the procedures described in paragraphs ii and iii under section 3 on p. 784 will be required.

When the muscular or muscular and mucous coats have been wounded, or when there is a raw surface left on the bowel which cannot be satisfactorily covered in, it is advisable to insert a drainage-tube down to the wounded area so that if there is any leakage there may be an avenue of escape.

CHAPTER XXX

POST-OPERATIVE TREATMENT

i. Immediate. i. **The room.**—If the operation has been performed in a private house, or nursing home, the room should be properly ventilated, the window being opened at the top. Care must be taken that the patient is not in any draught and, if necessary, screens must be arranged to prevent this.

The temperature of the room should be kept from 65° F. to 70° F.

The room should be darkened by pulling down the blinds, or covering the artificial light so that it does not shine directly on the patient's face, no one being allowed in the room whose presence is not absolutely necessary.

If the operation has been performed in a private house, the nurse should see that the room is tidied up and that all unnecessary articles of furniture are removed before the patient recovers from the anæsthetic.

The nurse will require an arm-chair to sit in, a book to write her report in, and a pen and ink. She should not leave the room to summon help, or to obtain any article she requires, but should ring the bell for this purpose. If there is a coal fire in the room it should be made up without causing an appreciable noise, by having small pieces of coal wrapped up in paper bags, or by the nurse putting on the coal with a gloved hand. There should not be any necessity to use the poker; rattling with fire-irons distresses many patients exceedingly.

ii. **Instruments.**—If the surgeon wishes a nurse to clean his instruments, he should give her correct directions. They should be well scrubbed under running water with a nail-brush and soap, all joints and ridges being carefully examined to see that no débris is adhering to them. After this they should be boiled for 20 minutes, and dried hot straight from the sterilizer. Instruments in frequent use should be polished at least once a week.

A flushing curette should have a fine wire passed through it to make sure that blood is not left behind, and after it has been boiled, a little methylated spirit should be run through it, which will dry it and so prevent the inside from rusting.

Reverdin's needle requires special attention. It must be removed from its holder first and must be thoroughly washed before it is boiled, for otherwise the slide will become fixed by coagulated blood. The

eye should be opened by pulling back the slide before boiling, and it must be put away in that position, but the slide should never be entirely pulled out. After it has been boiled it should be placed in methylated spirit for a few minutes so as to ensure absolute dryness. Needles in store are best kept in a little jar of machine oil.

iii. Attention to patient.—Immediately before the patient is returned to bed any hot-water bottles which have been placed therein should be removed and she should be covered with a hot blanket. Unless specially ordered by the surgeon, hot-water bottles should not be used until the patient has fully regained consciousness or, in the case of spinal anæsthesia, until sensation has completely returned. If on account of shock they are employed, care must be taken that they are efficiently covered with flannel, more especially the metal stoppers. Hot-water bottles should always be placed *outside the blanket* covering the patient, and their position should be carefully noted from time to time, because a restless patient may kick away the blanket covering them and thus become exposed to their direct action.

The patient's head must be kept low and on one side, a pillow should be placed under her knees and, if the operation has been serious and prolonged, the recovery from any shock present may be assisted by raising the foot of the bed with wooden blocks, or books. When the patient recovers from the anæsthetic, a pillow should be placed under her head. If the patient commences to retch, the nurse, if the operation has been an abdominal one, should hold the patient's abdomen to prevent so far as possible any strain on the stitches. A small porringer should be adjusted so that it will collect any ejected material, and a towel should be fastened round the patient's neck, so that her nightgown and the sheets may not be soiled.

After the sickness, if any, is over, the mouth should be cleaned with glyco-thymoline or glycerin and borax, applied with little squares of old linen or muslin held in a pair of forceps.

It sometimes happens that patients are extremely noisy and hysterical when recovering from an anæsthetic, and on occasion it is difficult to prevent them from throwing themselves out of bed. It is more common for patients to act thus after minor operations, but patients suffering from severe operative shock are often very restless. Great excitement may follow the use of the barbiturates, e.g. avertin.

Surgeons and nurses must regard whatever the patient says under the influence of the anæsthetic as sacred, not to be mentioned to anyone, even to the patient herself. The patient, if anything she has said is repeated to her, will not believe that she has been told all, and will fear that she may have said things which would better have been left unsaid. Every doctor knows of cases in which nurses have repeated to their patients remarks they have made while unconscious, and have been

surprised to find that what was intended to interest caused mental distress.

2. **The pulse.**—The best and most reliable guide to the patient's condition after an operation is the character and rate of her pulse, but as these vary so much in different individuals, even in apparent health, it is most important that the character of the pulse should have been carefully noted, and its rate charted, during the days before operation, so that its pre-operative condition may be taken into account when estimating its post-operative characters. The pulse-rate should be taken every 4 hours and charted. It is impossible to over-estimate the value of the pulse as a guide to the diagnosis, prognosis, and treatment of the complications following abdomino-pelvic surgery. To put it broadly, the pulse-rate should be highest during the first 24 hours after operation, but should not even then much exceed 100 per minute.

If all is going well, the pulse-rate should certainly have fallen in 48 hours, for a rising pulse-rate after that period is of disturbing import. In estimating the pulse, the peculiarities of the patient, the nature and length of an operation, and the amount of blood lost must always be taken into account. A gradually rising pulse-rate combined with distension of the abdomen and increasing fever makes it practically certain that there is something gravely amiss within the abdomen.

The pulse-rate increases to 140 per minute or over with the complications of shock or hæmorrhage. A quite temporary rise invariably occurs as the patient is coming out of the anæsthetic. Slowing of the pulse-rate down to 60 to the minute or even less is observed in some phases of shock, but it is not a bad sign in itself, being probably an effort on the part of Nature to conserve the power of the heart. A pulse-rate abnormally slow, but beating strongly, is an extremely good sign, just as it is in a recently delivered woman.

Mental excitement in a neurotic individual may cause alarmingly rapid heart action, while cases of heart-hurry, due probably to some peculiarity of the cardiac innervation, are occasionally observed.

Certain kinds of pain, notably of a twisted ovarian cyst, and also biliary and renal colic, are associated with marked slowing of the pulse-rate.

3. **Respiration.**—A rapid respiration-rate is a most ominous sign after abdominal section. Occurring soon afterwards, it points to shock or hæmorrhage, while its presence later on is associated with such grave complications as peritonitis, pneumonia, massive collapse of the lung, and intestinal obstruction.

4. **Temperature.**—It is just as important to take the patient's temperature as long as possible before the operation as to make a note of the quality of the pulse and its rate. The temperature, therefore, should be taken twice daily and charted. After the operation the

temperature should be charted every 4 hours. If there is any doubt as to the correctness of the temperature when taken in the mouth the thermometer should be placed in the axilla or between the legs; and if there is any suspicion that the instrument is at fault, another should be used as a control. It is an excellent rule on the first visit after an operation to lay the back of one's hand on the patient's face. A warm face is incompatible either with shock or with hæmorrhage; thus the presence of this simple sign assures one that these two complications, so important, and so necessary to diagnose at once, are absent. In an average case the temperature rises pretty abruptly to 99.5° or 100° F. within the first 6 or 8 hours. During the next 12 hours it frequently rises half a degree higher. It then begins to fall, and should reach the normal in from 1 to 3 days. Many patients, however, never exceed 99.5° F. at any time, while others maintain a temperature of 99° F. to 100° F. for a week without assignable cause or obvious ill-effects. A subnormal temperature indicates shock or hæmorrhage. A rapidly rising temperature is bad at any time, but it is especially so on the second or third day when peritonitis may be feared as a likely cause. A persistent high temperature after operation, without anything obvious to account for it, should always lead to an examination of the abdominal wound for a stitch-abscess, of the pelvis for a hæmatocœle, and of the urine for signs of pyelitis. Fever occurring in the second week may be due to an inflammatory effusion around a ligature, the onset of pyelitis, or may be the herald of femoral thrombosis. Violent nervous disturbance may lead to a very marked and sudden elevation of temperature, which, however, is not maintained. It is accompanied by a full though rapid pulse, and there is an absence of local abdominal and pelvic signs. These points will allay anxiety. Ether-bronchitis will maintain high fever for some days.

5. *Tongue*.—The tongue, after the first 24 hours following an abdominal section, should be moist. It is generally whitish in colour so long as the patient is not taking solid food. In such grave conditions as peritonitis and intestinal obstruction it is dry, brown, and cracked, or glazed, red, and ulcerated; such appearances are of very bad prognosis.

The greatest pains should be taken with the cleansing of the mouth after all cases of abdominal section, lest it become foul. Glycothymoline and listerine both make admirable mouth-washes.

6. *Thirst*.—One of the bitterest complaints of a patient during the 24 hours succeeding a severe operation is that of thirst. If the patient cannot drink on account of vomiting, the best way to relieve this is to inject 6 ounces of saline solution into the rectum every 4 hours. Rinsing the mouth out with water, hot or cold, into which a little lemon-juice may be squeezed, or with soda-water, is the best treatment. Ice

should not be given ; it causes flatulence, makes the tongue sore, and relieves thirst only until it has melted.

7. **The bladder.** (a) **Vaginal operations.**—After vaginal operations there is, as a rule, no necessity to use the catheter, unless there be retention of urine.

When it has been necessary to pack the vagina tightly the catheter will need passing. Some patients after colpo-perineorrhaphy are unable to pass urine, and the catheter may have to be used for some days, while after the operation for stress incontinence the patient almost invariably has retention for a few days. In operations involving opening and suture of the bladder, it is advisable to tie in a catheter and apply continuous suction through it.

(b) **Abdominal operations.**—In certain abdominal operations involving shock, or disturbance of the ureters or bladder, the catheter should be passed 20 hours after the operation, in order to estimate the quantity and character of the urine. When pressure forceps have been left on to stop hæmorrhage in vaginal hysterectomy, the urine must be drawn off every 8–12 hours until they are removed, and, during the manipulations necessary for this object, the greatest care must be taken not to disturb the forceps. In Wertheim's operation, the urine should be regularly drawn off, for in these cases absolute temporary paralysis of the bladder is the rule.

The amount of urine passed each time should be carefully measured, and any abnormality in its appearance, such as the presence of blood, noted. The quantity first passed or drawn off after operation amounts, as a rule, to from 4 to 7 ounces, but after a very severe one urine may not be secreted for several hours, and then only in small quantities. If the quantity is less than 4 ounces, one naturally thinks of shock, suppression, or injury to the bladder or ureter. In the latter case the urine may be mixed with blood, but it is not necessarily so. After Wertheim's operation the power of the bladder returns gradually. Voluntary micturition is usually possible in about a week, but the bladder is only partially emptied and the complete function is only restored two or more weeks later. During the phase of absolute paralysis the catheter will need passing every 6 or 8 hours ; later on, twice a day ; and finally, once a day until there is practically no residual urine.

Catheterization.—By the careless use of the catheter a patient may sustain damage, due to the introduction of micro-organisms into her bladder, which may cause many weeks of misery, or may even be the immediate cause of her death. The cystitis thus set up may spread by way of the ureters to both kidneys, or to one kidney which may become so disorganized that anything short of its removal will fail to save her.

Five absolute rules have to be remembered by the nurse when

using a catheter : (1) to make her hands as aseptic as she possibly can ; (2) to sterilize the catheter ; (3) to swab the vulva, more especially that part where the orifice of the urethra is situated, with a solution of biniodide of mercury, 1—1,000 ; (4) to be sure she identifies the urethral orifice ; (5) to dip the point of the catheter, immediately before passing it, into some strong but non-irritant antiseptic ; Violet-green is the best. Sometimes it is not so easy to identify the orifice as might be supposed and pain and much distress may be caused to the patient by digging about with the catheter to find the urethra. If, by mistake, the catheter has been inserted into the vagina, another sterilized catheter must be obtained. In any cases of doubt or difficulty a swab placed in the entrance of the vagina will obviate such a mistake. In cases of pan-hysterectomy, if the catheter is inserted into the vagina, it may be forced through the sutured vaginal flaps and bleeding may result.

A soft rubber catheter of small size, well lubricated, is a better instrument to use than one made of glass, as it is not so likely to abrade the delicate surface of the urethra.

8. **Stimulating intestinal tone.**—The introduction of acetylcholine and prostigmine by Dale has given us a method of stimulating the intestinal muscle much more powerful than anything we have previously had. The former appears to be the link which connects the nerve endings with the muscle fibres, and the latter promotes its action. The dose of acetylcholine is 0.1 g. and of prostigmine 0.0005 g. Both are now obtainable in ampoules, and an ampoule of each should be given hypodermically, followed 15 minutes later by a glycerin enema. This proceeding may be repeated every 4 hours if necessary, and is to be employed in all cases when flatulent distension with failure to pass flatus is not relieved by the rectal tube or enemata, the only exception being those cases in which it appears that the condition is due to organic obstruction.

9. **Opening the bowels.** (a) **Vaginal operations.**—On the second night after the smaller vaginal operations the patient is given an aperient, and the following morning an enema if necessary, after which the bowels are kept acting regularly. The exact form of aperient is not a matter of much importance, and the patient may be ordered any which she is in the habit of taking.

When the operation has been of a plastic nature in the neighbourhood of the rectum, such as complete perineorrhaphy, or for recto-vaginal fistula, the management of the bowels is a matter of great importance. On this account we keep the bowels confined for 4 to 6 days, and then give a dose of cascara or senna, having prepared the bowel for it by giving a dessert-spoonful of liquid paraffin three times a day for the 2 previous days. Violent purgatives like castor oil are to be avoided, especially after operations for complete rupture of the perineum, for the diarrhoea often produced has a digestive action on catgut.

A useful aperient for routine use in constipated patients is the following :

B Ext. cascara. liq. ʒj
 Mag. sulph. ʒj
 Tr. hyoscyami ʒss
 Ext. glycyrrhiza liq. ʒss
 Aqua ad ʒj

Dose, from 2 teaspoonfuls to 2 tablespoonfuls.

(b) *Abdominal operations.*—After abdominal section, the method of opening and keeping open the bowels will depend upon the circumstances. For a straightforward and satisfactorily progressing case an aperient should be administered by the mouth on the fourth evening after the operation, and if it does not act by noon next day a glycerin enema should be given. Cascara is the aperient we use as a rule. There is no object in getting the bowels open sooner than this, for the first action is always accompanied by more or less discomfort, and the patient is sufficiently uncomfortable during the first 48 hours after the operation without having the added discomfort of an evacuation. An early action of the bowel is supposed, by some, to lessen the period of disturbed peristalsis and flatulence which always occurs more or less after abdominal section, but our experience, after trial of both methods, is that it does nothing of the sort.

In cases in which the abdominal condition is not satisfactory, especially when distension is present, the administration of any aperient is particularly to be avoided, for the sudden hurrying down of the intestinal contents may turn a threatened into a definite obstruction. In such cases the bowels should be relieved by repeated glycerin enemata or rectal wash-outs. On no account should castor oil be used "to give her a good clear-out." This mistaken treatment is painfully associated in our minds with certain urgent calls to see patients who were vomiting faecal matter.

During convalescence any suitable aperient may be given to keep the bowels open. The cascara mixture just set out is very useful.

Rectal tube.—The rectal tube, if it is required to relieve flatulent distension (*see* p. 826), is first passed 24 hours after the operation, and it may then be used every 4 hours as long as is necessary. Many patients do not require it at all. It is useless, as a rule, to pass it sooner than 24 hours, because post-operative flatulent distension takes that time or longer to reach the rectum. If rectal saline injections are being administered, the rectal tube should first be passed.

Further, it is useless to endeavour to pass the tube more than four inches up the bowel, as it turns on itself at the sudden bend between the fixed rectum and the movable colon.

If the end of the tube is well smeared with vaseline, very little discomfort will be caused when passing it, while the relief to the patient is often very marked. If the patient suffers from hæmorrhoids, the

passage of the tube may cause great pain, which can be obviated, in some degree, by introducing into the rectum a cocaine suppository shortly before. The tube is left in position so long as any flatus passes; in the absence of flatus it should be left *in situ* from 5 to 10 minutes. The flatus should be made to pass into fluid by holding the free end of the tube under boric acid or mercury solution contained in a porringer.

If the natural expulsion of flatus is delayed much longer than 24 hours the patient will commence to experience some discomfort, in which case a rectal wash-out, or a glycerin or soap enema, is indicated and usually affords great relief (*see pp. 826-827*).

10. Diet. (a) *Minor operations.*—Six hours after most vaginal operations the patient is given 4 ounces of tea and milk, or of hot milk-and-water, and then, as soon as the sickness due to the anæsthetic has passed off, ordinary diet is allowed. In the case of complete perincorriaphy the feeding depends upon which day the surgeon orders the aperient, because before this, ordinary liquid diet is prescribed. After the bowels have been well opened the patient is given bread and butter, custard, and fish, and then quickly returns to her ordinary diet.

(b) *Abdominal operations.*—For the first 24 hours after an abdominal operation, water, either hot or cold, is all a patient needs, though if she desires it she may have weak tea, milk well diluted with water, or water into which lemon or orange juice has been squeezed. After this period most patients are able to take a little solid food such as a biscuit or thin toast, but many of them prefer liquids for the first 3 days. There is not the slightest need to force "nourishment" on a patient whose only desire is for water, for water by itself is sufficient to keep all the vital processes going for many days. Feeble patients, or patients suffering from shock, should have rectal injections of glucose in saline solution, but usually a patient after an average operation does not need them. The desire for solid food rarely returns until after the bowels are open, i.e. somewhere about the fourth day, and from thence onwards she should be placed on solid diet, beginning with easily digestible things such as steamed fish or pounded chicken, and increasing the menu as her condition improves and her appetite returns. The nurse must enter in the case-book the total nourishment given every 24 hours; indeed she should make notes of all points bearing on the progress of the case.

The following tables form a guide to how the patient should be treated, supposing she is progressing normally. This routine will require modification in individual cases, but it will be found useful for institutional work where definite rules have to be laid down.

**TIME TABLE FOR NURSING AND FEEDING THE
PATIENT IN ABDOMINAL OPERATIONS**

<i>Hour</i>	<i>Directions</i>	<i>Nourishment</i>
	TWO NIGHTS BEFORE	
	An aperient, such as cascara sagrada in some form.	
	FIRST DAY	
5 a.m.		Chicken tea. Cup of tea, bread and butter, rusk or biscuit.
8.20 a.m.	Hypodermic injection of morphia gr. $\frac{1}{6}$ with atropine gr. $\frac{1}{100}$, or scopolamine gr. $\frac{1}{120}$ with atropine gr. $\frac{1}{100}$ and heroin gr. $\frac{1}{6}$, forty minutes before the operation.	
8.45 a.m.	Catheter, if ordered.	
9 a.m.	Operation. When the patient is returned to bed she must be covered with a warm blanket, and hot bottles should be removed from the bed, unless otherwise directed. A pillow can be placed under the patient's knees if it adds to her comfort, and her head kept low. If retching or sickness supervenes she is to be turned slightly on her left side and her abdomen is to be supported by the nurse laying the flat of her hands on each side of the stitches. After operations for acute sepsis, when drainage has been employed, it may be advisable to prop the patient up in Fowler's position from the moment she returns to bed. If the patient is suffering from shock or has had a spinal anaesthetic the foot of the bed should be raised. Cases with marked shock are usually treated by intravenous injection either of saline-glucose solution, plasma or blood.	If the operation has to be performed in the afternoon, say at 2 p.m., tea and bread and butter will be given at 6 a.m. and beef tea at 10 a.m. The catheter, if ordered, will be passed at 1.45 p.m. and the hypodermic injection given at 1.20 p.m.
2 p.m.	Pulse, respiration, temperature. If shock is present, a rectal injection of saline solution with glucose \mathfrak{J} should be given every 4 hours, brandy being added if necessary. If the patient is unconscious, a pint of saline can be given. When conscious, 6 to 10 ounces will probably be all she can retain. If the patient complains much of pain when she has recovered from the anaesthetic, a hypodermic injection of morphia gr. $\frac{1}{6}$ or $\frac{1}{4}$ is given.	
6 p.m.	Pulse, respiration, temperature. Patient may have one or two pillows.	Hot or cold water (\mathfrak{J}), as preferred, to be given frequently to the patient when awake.

Hour	Directions	Nourishment
FIRST NIGHT		
8 p.m.	A hypodermic injection of morphia gr. $\frac{1}{2}$, to be repeated if necessary, may be given if the patient is in pain.	
10 p.m.	Pulse, respiration, temperature	After the patient has quite recovered consciousness, she may be allowed to drink $\bar{3}$ v to $\bar{3}$ vi of water at a time. Such comparatively large quantities are not so apt to cause sickness as small ones.
2 a.m.	Pulse, respiration, temperature. Pass a catheter if the patient has not passed her urine naturally 17 hours after the operation, and measure urine.	
SECOND DAY		
6 a.m.	Pulse, respiration, temperature.	
7 a.m. to 9 a.m.	The patient's hair should be brushed and plaited. Her hands, face, shoulders, and lower part of her back to be washed. The back and shoulders to be rubbed with eau-de-Cologne and boric powder. Mouth to be cleansed. Draw-sheet and top-sheet to be changed. The amount of nourishment taken, sleep obtained, and urine passed to be entered in the report book. If the patient passes only a small quantity of urine the catheter must be passed to ascertain if there is any residual urine, and if so the catheter must be used till practically all the urine is evacuated naturally. The patient should be placed in Fowler's position if it has been ordered, but a patient who is doing well may choose her own position. She should be encouraged to move herself about and specially to move her legs.	Cup of tea and milk, with a biscuit or bread and butter.
10 a.m.	Pulse, respiration, temperature. Wound to be dressed if necessary	During the day a glass of milk and soda or barley water or plain water may be given from time to time, as desired, or chicken tea or beef tea.
2 p.m.	Pulse, respiration, temperature.	
4 p.m.	During the second day flatulence may become troublesome and painful. It is at first felt in the stomach, when small drinks of hot water with a few drops of essence of peppermint may relieve it. Later, as the	Cup of tea and milk with bread and butter.

Hour	Directions	Nourishment
SECOND DAY (continued)		
intestine becomes distended, the flatulence is best relieved by passing the rectal tube to allow of the escape of flatus, and if this does not afford relief, a glycerin enema or rectal wash-out should be given before the rectal tube is withdrawn. These measures may be repeated, if necessary, every four hours.		
6 p.m.	Pulse, respiration, temperature.	
7 p.m.	The patient and bed-linen to be attended to as before. The amount of nourishment taken, sleep obtained, and urine passed to be entered in report book.	
SECOND NIGHT		
10 p.m.	Pulse, respiration, temperature. Mouth to be cleansed.	
11 p.m.	.. .. .	Drinks of milk and soda or milk and barley water during the night if wished for.
2 a.m.	Pulse, respiration, temperature, if patient is awake.	
THIRD DAY		
6 a.m.	Pulse, respiration, temperature.	
7 a.m.	The patient and bed-linen to be attended to as before. The amount of nourishment taken, sleep obtained, and urine passed to be entered in report book.	Cup of tea and milk. Bread and butter. Bouled egg if patient would like it.
9 a.m.		
10 a.m.	Pulse, respiration, temperature. Wound to be dressed if necessary.	Milk, beef tea or chicken broth.
1 p.m.	.. .. .	Fish, calf's foot jelly or custard.
2 p.m.	Pulse, respiration, temperature. Mouth to be cleansed, wash hands and face.	
4 p.m.	.. .. .	Cup of tea and milk, bread and butter, jam or cake.
6 p.m.	Pulse, respiration, temperature.	
7 p.m.	The patient and bed-linen to be attended to as before. The amount of nourishment taken, sleep obtained, and urine passed to be entered in the report book.	Milk or soup.

Hour	Directions	Nourishment
THIRD NIGHT		
10 p.m.	If the patient is progressing normally, omit four-hourly temperature, respiration, and pulse, and take these only twice daily, morning and evening.	Drinks of milk, water or barley water during the night if wished for.
FOURTH DAY		
6 a.m.	A glycerin enema to be given if necessary.	
7 a.m. to 9 a.m.	The patient and bed-linen to be attended to as before. The amount of nourishment taken, sleep obtained, and urine passed to be entered in report book.	Cup of tea and milk, bread and butter, boiled egg.
10 a.m.	Pulse, respiration, temperature. Wound to be dressed if necessary.	Milk, beef tea or chicken broth.
1 p.m.	.. .. .	Fish, custard pudding, piece of bread.
4 p.m.	.. .. .	Cup of tea and milk, bread and butter, jam, cake.
6 p.m.	Pulse, respiration, temperature.	
7 p.m.	The patient and bed-linen to be attended to as before. In addition the bottom sheet should be changed. The amount of nourishment taken, sleep obtained and urine passed, and the number of times the bowels have acted, to be entered in report book.	Rabbit, chicken or mince, custard pudding, bread or biscuit.
FOURTH NIGHT		
	Some preparation of cascara sagrada is given.	Drinks of milk, water or barley water during night, if necessary.
FIFTH DAY		
7 a.m. to 9 a.m.	The patient and bed-linen to be attended to as before. The amount of nourishment taken, sleep obtained and urine passed, and the number of times the bowels have acted, to be entered in report book.	
8 a.m.	.. .. .	Cup of tea and milk, bread and butter, boiled egg.
10 a.m.	If dressings have been used, these to be renewed. Pulse, respiration, temperature.	
12 noon	If the cascara has not acted a glycerin enema should be given to start it.	

Hour	Directions	Nourishment
FIFTH DAY (continued)		
1 p.m.	.. .. .. .	Lunch.
2 p.m.	Mouth to be cleansed. Wash hands and face.	
4 p.m.	.. .. .. .	Tea.
6 p.m.	Pulse, respiration, temperature.	
7 p.m.	The patient and bed-linen to be attended to as before. The amount of nourishment taken, sleep obtained, and urine passed, and the number of times the bowels have acted, to be entered in the report book.	Dinner.
FIFTH NIGHT		
7 n.m.	The patient and bed-linen to be attended to as before. The amount of nourishment taken, sleep obtained, and urine passed, and the number of times the bowels have acted, to be entered in report book.	
to		
9 a.m.		
SIXTH DAY		
	The pulse, respiration, and temperature are to be taken twice daily, and the patient is attended to as before. Michel's clips to be removed and the abdominal wound to be then painted with the iodine solution, if this was used in the first instance.	Diet as before; mutton may be substituted for chicken
SEVENTH DAY		
	Attendance as before.	For this and the following days the ordinary diet may be renewed.
EIGHTH DAY		
	Skin sutures, if they have been used, are to be taken out.	
TENTH DAY		
	If silk or silkworm or nylon gut through-and-through sutures have been used, they should be removed.	

II. Dressing. (a) *Vaginal operations.*—A pad of sterilized gauze held between the legs by a T-bandage, and changed as often as it becomes soiled, is all the dressing we ordinarily use. Unless there is some special indication we do not have the vagina douched, but in cases in which sutures are exposed on the perineum, or adjacent skin surfaces, the parts are advantageously irrigated twice a day with a weak antiseptic solution such as *flavine* 1-in-1,000, or *dettol*, 1 drachm, made up to a pint.

In cases in which a number of catgut sutures are placed in the vagina, such as colporrhaphy or amputation of the cervix, the discharge towards the beginning of the third week may become a little offensive. Gentle douching of the vagina is then useful; a rubber nozzle should be used and not a glass one, for fear of damaging the recently united wound.

If packing has been used to control bleeding it is removed the morning after the operation, except in operations like vaginal hysterectomy, when it should be left at least 48 hours. Its withdrawal must be carried out very gently, to minimize the pain and ensure that the gauze is not broken off short.

Unless the operator intends to remove the gauze himself, he should remind the nurse that it has been inserted and has to be removed. Failure to do so has resulted in the gauze being left *in situ* with the result that a horribly offensive discharge appears, the cause of which may not be ascertained for some days.

Catgut sutures in the vulva, perineum, or vagina, should be left to separate of themselves. Silkworm or nylon gut sutures in any of these situations will be removed from the 10th to the 20th day according to circumstances.

After *vaginal hysterectomy* if, because of hæmorrhage, forceps have been left on, they may be disturbed by the patient while she is recovering from the anæsthetic, and the nurse must take particular care to prevent this. There is also some danger of the nurse detaching the forceps when attending to the patient, unless she uses great care.

When the ligatures commence to separate, usually about the 10th day, there may be an offensive vaginal discharge, and in this case a vaginal *douche of flavine*, 1-in-1,000, will be indicated, but in no circumstances should a *douche* be given until a week after the operation. The *douche* must be given with very little pressure, the can being held only just a little higher than the bed and a rubber nozzle used.

(b) *Abdominal operations.*—The superficial stitches are taken out on the 8th day, and if deep retaining sutures have been used, these are removed on the 10th day. The wound is then re-dressed. If Michel's clips are used, these should be taken out on the 6th day. When a drain has been left in, the dressings will have to be changed as often as they are soiled. If gauze has been inserted to check hæmorrhage, it is

removed in 24 hours, and the hole may then be closed by an interrupted stitch that has been purposely left untied at the operation. If a drainage-tube has been used because pus has soiled the peritoneal cavity, or because the bowel has been injured, it should be left *in situ* for at least 48 hours and cleansed daily with small wicks of gauze or wool passed down it. The tube should remain in so long as there is much discharge, and should be slightly shortened every day. Further information on the management of drainage-tubes will be found on p. 49.

12. **Position of the patient in bed.** (a) *Vaginal operations.*—In most of the vaginal operations the position assumed by the patient in bed is of no particular import. After *perineorrhaphy*, owing to the local swelling and tenderness the patient will be more comfortable on her side.

(b) *Abdominal operations.*—As soon as the shock of the operation has passed off, the patient should be well raised on pillows into the semi-reclining posture. This, besides being on the whole the most comfortable position, has the great advantage that it encourages the gravitation of peritoneal fluid into the pelvis and minimizes any risk of general peritonitis. In 24 hours or less the patient should from time to time be turned on to her side, being kept in that position by pillows placed under her shoulder and hip. Some patients are more comfortable supine, and there is no objection to this except when sepsis is present—particularly if it has necessitated drainage—then the full Fowler position should be maintained from the first. If her condition is satisfactory she should, after the first 24 hours, be encouraged to change her position herself and freely to move her arms and legs, for movement counteracts the retardation of blood flow in the lower limbs which generally follows abdominal section (*see p 866*).

Exceptions.—Patients with symptoms of shock should be kept supine, with the foot of the bed well raised, until they are better. After spinal anæsthesia, also, the foot of the bed should be raised for 12 or 24 hours. If the patient is very anæmic from hæmorrhage before, or during, the operation, she must be kept as quiet as possible for a longer period and must not be allowed to exert herself in any way, as the danger of a sudden syncope is always present for some days. Again, if the patient is elderly, or is subject to bronchitis, or if bronchitis or broncho-pneumonia supervene on the administration of the anæsthetic, she must be propped up on pillows as soon as possible.

The best apparatus for maintaining a patient in the sitting posture is a bolster placed across the bed immediately below her buttocks. The bolster is kept in position by means of two pieces of bandage, one end of each being sewn to the end of the bolster, and the other tied to the bedposts at the head-end of the bed.

13. **Toilet of patient.** *Mouth.*—Every four hours until the patient is strong enough to use her toothbrush, the mouth and teeth should be cleansed with pledgets of old linen soaked in glyco-thymoline.

False teeth should not be replaced till the morning following the operation, and not then if the patient is suffering with sickness.

Hair.—The hair should be brushed, combed, and plaited twice daily.

Hands and face.—The hands and face should be washed with warm water and soap thrice daily, at 7 a.m., 2 p.m., and 7 p.m. At the end of a week after major operations, if she so desires, the patient may be allowed to wash her hands and face herself.

Body.—The body should be sponged once daily with warm water, and special care must be taken to cleanse the perineal region each time after the patient has defæcated or passed water.

Back.—On the morning after the operation the shoulders and back of the patient must be specially treated.

With the help of another nurse the patient is gently turned on her side. The shoulders and back, which now come into view, are first sponged with warm water, then washed with eau-de-Cologne or methylated spirit, and lastly dried with oxide of zinc and starch powder mixed in equal proportions. This should be done twice daily, at 7 a.m. and 7 p.m.

Dress.—The patient should be dressed in a nightgown which has been made to open down the back. There should be two nightgowns in use, one for the day and one for the night. Ideally she should have a clean nightgown every day, and oftener if necessary, and these may be so arranged that the clean nightgown of one day will do for the night but one following. If the Violet-green preparation is to be used in preparing the operation area, the patient should be warned that her nightgown will be stained and, therefore, advised to wear for the first 10 or 12 days garments which she does not mind being so stained. A woollen dressing-jacket must also be worn, and, to save disturbing the patient, it can quite well be put on with the back to the front. The front of her chest should be kept covered with wool or Gamgee tissue if the room is draughty or the patient inclined to bronchitis.

14. Bed-clothes.—The patient who is much shocked should have a blanket next to her and not a sheet; it keeps her warmer. It is a mistake, however, to overload patients with blankets so that they are kept sweating, for this dehydrates the body and increases thirst.

The draw-sheet is changed, as a routine, twice daily, at 7 a.m. and 7 p.m., when the patient's back is being washed, and at any other time when it is soiled. The bottom sheet is changed once a week only, unless soiled, or the patient desires and can afford a more frequent change. The top sheet may be changed according to the pleasure and the pocket of the patient.

15. Medicine.—As a rule, medicinal treatment is not prescribed for patients for the first fortnight after an operation, apart from aperients or any other drugs which the surgeon may order for some

particular complication. As regards aperients, it is well to remember that an action once every other day is sufficient for a patient lying in bed. For routine use after the bowels have been opened on the fourth day the aperient chosen should be preferably that to which the patient has previously been accustomed. Patients in bed usually require twice the dose of aperient that they would take in normal circumstances.

After a fortnight, a tonic may be indicated.

16. **Belts.**—We are not in the habit of ordering abdominal belts for our patients after *cœliotomy*, except when, owing to the weakness of the tissues or suppuration of the wound, a ventral hernia is to be feared. The belt or corset she is accustomed to wear is sufficient, but if she can afford it, it will be best that she should be fitted with a new one, as the shape of the abdomen is always temporarily altered after abdominal section.

17. **Visitors.**—It is so necessary that the patient should be kept quiet after a major operation, that ordinary visitors should not be allowed to see her for the first week, and if possible the husband, or parents, should not be long with her for the first 3 days. To satisfy the nearest relatives, one of them may be allowed to see the patient for a few seconds after the operation, when she is back in bed, and most probably still under the influence of the anæsthetic.

18. **Postoperative stay in bed.**—Under this head the surgeon must take into consideration the general condition of the patient. If she has been ill for many weeks before the operation, she will have to keep to her bed longer than is usual for the particular operation that she has undergone, and if any complications arise the time must obviously be prolonged. In the majority of instances, however, the patient, or her friends, may be given a fair idea of the time necessary for convalescence; and this, in some cases, is a matter of much importance, as when the expenses of a nursing-home have to be taken into consideration.

(a) **Vaginal operations.**—After *perineorrhaphy*, *colporrhaphy*, or *amputation of the cervix*, the patient gets up on the 17th day.

Curetting, *removal of polypi*, or *minor vulval and vaginal operations.*—The patient rises on the 5th to 7th day if all loss and discharge has stopped.

Excision of the vulva.—The patient gets up on the 14th day if the parts have healed cleanly, otherwise she may need as much as 3 weeks in bed.

(b) **Major operations.**—Surgeons differ as to when they allow their patients to get up after these operations, the time varying from 3 to 14 days. We are not generally in favour of early rising, believing that the "rest cure" entailed by the patient keeping in bed is extremely beneficial to almost all women, and particularly so to poor hospital patients.

As the result of our experience, 14 days seems to be the best time in the majority of cases, but simple straightforward cases can be got up at the end of the first week.

The modern practice of getting patients up during the first week, even after severe operations, is largely the result of the belief that recumbancy favours thrombosis of the veins of the leg and therefore pulmonary embolism. It is certain that sheer immobility of the legs does not cause thrombosis, *vide* cases of paraplegia, but allowing that it does so after surgical operations, there is no reason why the patient should not move her legs freely while in bed. More movement is effected this way than by merely sitting in a chair. The practice of early rising in hospitals has the advantage of making more beds available.

19 Resumption of usual occupation.—After the majority of minor operations patients are soon able to resume their normal occupations. When the operation has been performed for prolapse of the genital organs, the patient should be warned not to undertake for some time any work or exercise which requires straining of the pelvic floor.

It is advisable that patients should be sent away after an abdominal operation for at least 3 weeks, for a change of air. If a hospital patient, she should be sent to a convalescent home, where she will obtain adequate nursing. After most abdominal operations she will not entirely recover from the effects for 3 months, during which time she should take things as quietly as her circumstances will permit. On the resumption of active exercise, she should be careful, for some months longer, so far as possible to avoid any action which would throw much strain on her abdominal muscles.

CHAPTER XXXI

INFUSION AND TRANSFUSION

INTRAVENOUS INFUSION

Indications.—Intravenous infusion may be indicated for patients suffering from hæmorrhage, from shock, from peritonitis or from suppression of urine and is a necessity when continuous gastric suction is being employed for post-operative ileus.

Composition and temperature of solutions.—The strength of normal saline is approximately 1 drachm to the pint. Avery Jones and Naunton Morgan* have pointed out that when large quantities of the solution are infused the patient receives a great deal too much salt; the basic need of the body for which is only 3 grammes per diem. A normal person loses nearly 1,000 c.c. of water daily by perspiration and exhalation, and after severe operations the patient sweats profusely. In the first 24 hours after a major operation the fluid intake should be 3,600 c.c. to counteract dehydration by sweating, exhalation and vomiting, though the quantity should be dropped to 3,000 c.c. after the first day. Now 3,600 c.c. of normal saline contains 32 grammes of salt and this puts a heavy strain on the excretory mechanism and causes water to be retained in the tissues, whereby œdema of the lungs is promoted.

Instead, then, of using normal saline, they advise one part of normal saline to four parts of a 5 per cent. solution of glucose, which makes an isotonic solution and at the rate of 3,000 c.cm. a day supplies 100 grammes of glucose and 5.4 grammes of sodium chloride. For rectal infusion 1 part of normal saline to 4 parts of ordinary tap water is used. The commonly used 5 per cent. glucose in normal saline is hypertonic besides containing far too much salt. Hypertonic saline (5 per cent. Na. Cl.) is, however, useful in cases of paralytic ileus (see p. 857).

If sod. bicarb. is being infused in a case of diabetes (see p. 906), the strength of the solution should be 1 drachm to the pint. In cases of suppression of urine, sodium sulphate, 3.3 per cent., is commonly used, or hypertonic glucose, beginning with 500 c.c. of a 10 per cent. solution, and following it up with a 5 per cent. solution.

The temperature at which the solutions should be introduced should be 105° F. for massive infusion, but for drip infusion room temperature is sufficient.

Apparatus required.—The apparatus is that commonly employed for blood transfusion (see p. 813), but in emergency when such is not

**Lancet*, Sept. 9, 1939, p. 611.

obtainable, a simple glass container with a spout at the bottom is sufficient. Attached to it by a long piece of rubber tubing is a glass cannula with its open end at the end—not in the side. The simple outfit figured on p. 19 does well for such emergency.

Nowadays glass containers of sterilized water can be obtained in most large cities. In emergency where no such is obtainable, simple boiled water will have to be used to make the solution.

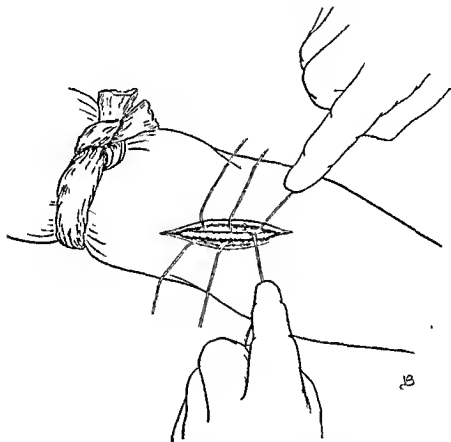


Fig. 591.—Saline venous infusion: Ligaturing the vein below.

Preparation of the patient.—One of the veins of the arm is usually chosen. If rapid mass infusion is contemplated, one of the ante-cubital veins is convenient, because they are large and easily entered. For drip infusion, however, one of the veins of the forearm should be chosen because the arm need not be immobilized. The skin is superficially sterilized by alcohol.

Operation of mass infusion.—To introduce the fluid into the vein a modified French's hollow needle is generally used, but its deep introduction needs experience, especially when the vein is collapsed. The

technique we are now going to describe means an incision over the vein, which is a drawback, but the method should certainly be adopted when the operation has to be carried out under bad circumstances, poor light and great emergency.

i. *Instruments.*—A scalpel, dissecting forceps, two light pressure forceps ("spider" forceps), an aneurysm needle, No. 2 silk, a piece of thin rubber tubing, needles for suture of the skin, and a syringe for injecting the area with novocaine. For constricting the upper arm the bandage of a blood-pressure apparatus is the best hut, if not obtainable, a piece of bandage or even a stout piece of silk or string will suffice.

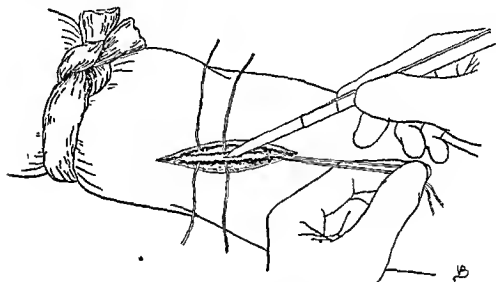


Fig. 592.—Opening the vein.

ii. *Isolating the vein.*—The arm is bandaged 4 inches above the elbow to stop the return of the venous blood, and so make the veins stand out and, the most prominent vein having been chosen, the skin over it is incised in the line of the vein, which is then separated from the tissues surrounding it.

iii. *Ligaturing the lower end of the vein.*—Three ligatures of silk are passed under the vein by means of an aneurysm-needle or, what will do equally well, a Bonney's needle used with the blunt end first. One ligature is tied at the distal end of the separated vein and the ends left long to act as a tractor, the second is used for tying in the cannula, and the third is reserved to ligature the proximal end of the vein at the end of the operation (Fig. 591). When the veins are very collapsed, it is important, before tying the first ligature, to squeeze as much blood as possible into the vein to be opened, by pressing it up from the lower arm. This makes the vein much easier to open.

iv. **Opening the vein.**—The vein is held up, taut and steady, by the long ends of the ligature just tied, which the operator takes in his left hand, and, a longitudinal opening having been made in the vein with the point of the scalpel (Fig. 592), the cannula is inserted into its lumen. The saline injection should be allowed to flow through the cannula before and while it is being introduced, so that all air bubbles may be expelled, and, the blood having been washed away, the opening in the vein is easily seen (Fig. 593).

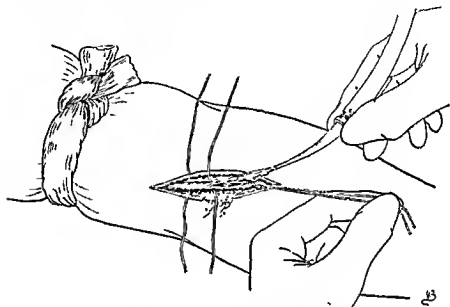


Fig. 593.—Introducing the cannula.

v. **Securing the cannula.**—When the cannula is in the vein the second ligature is tied tightly to keep the cannula in position, after which the bandage round the arm is removed and the saline solution allowed to run into the vein (Fig. 594). The amount of fluid run in will depend upon the purpose for which the injection is being used, and will vary from 1 to 3 pints. The receptacle containing the solution must not be allowed to become empty. If by chance this should occur, the tube must be at once pressed with the finger and thumb to prevent air from entering the vein. The ligature securing the cannula is removed when sufficient solution has been injected, and the third ligature is tied as the cannula is withdrawn, after which one or two interrupted sutures unite the skin-wound.

vi. **Alternative method.**—Instead of the technique just described, that commonly used for blood transfusion (see p. 818) can be employed. When, however, infusion has to be resorted to under circumstances of poor light, inexpert assistance and profound collapse on the part of the patient, the method first described will be found easier, especially if

it is being carried out by one not accustomed to exposing and entering a vein, because it lays bare a greater length of the vein and failure to insert the cannula can be met by following the vein up and trying again there.

Difficulties.—Although this operation is apparently so simple, we have not infrequently seen the attempt to introduce the cannula into the vein fail. This is owing to the trying circumstances in which it sometimes has to be performed, the surgeon in his hurry omitting the careful performance of the technique we have just described. Frequently the skin-incision is made too small, and time is wasted in identifying the vein. Instead of being freed, the vein may be merely exposed and opened without the previous application of the distal ligature. The free flow of blood which then occurs prevents the operator from seeing the hole through which he must pass the cannula, and he is further unable to lift the vein out of the wound so as to see clearly what he is

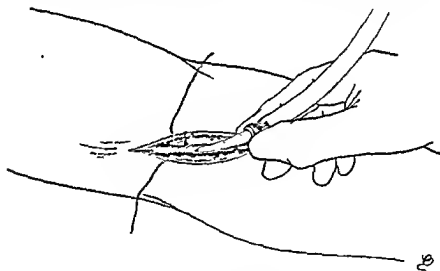


Fig. 594.—The cannula tied in.

doing. The result is that he more often than not passes the cannula into the perivenous sheath instead of into the vein itself.

When the vein is very small or shrunken it is a mistake to incise it transversely for, if difficulty is encountered in inserting the cannula, the vein may be torn across. This cannot happen with a longitudinal incision.

In other cases the preliminary bandage round the upper arm may be forgotten, so that if the patient be much exsanguinated the vein merely presents as a flat white strap which is very difficult to open properly or into which, being opened, it is difficult to get the cannula. If in spite of every precaution the fluid cannot be introduced into the

vein chosen, some other vein must be tried. It may be remarked that if the patient is much collapsed the fluid at first flows very slowly; as the circulation improves, the rate will increase.

Dangers.—The most important fact to remember in connexion with intravenous saline injection is that in cases of hæmorrhage it should never be given *until the bleeding spot has been secured, or is immediately going to be secured.* We have seen cases in which, this precaution having been neglected, nearly all the blood of the body was washed into the peritoneal cavity.

In hæmorrhage, the best results are obtained if the saline injection is carried out at once, when its effects are nearly equal to blood transfusion. The longer it is delayed, the less efficacious it is, so that if a considerable time has elapsed since the onset of the symptoms, blood transfusion is an incomparably better procedure.

A further point of great importance to remember is that in cases of pure shock the use of intravenous infusion requires much consideration. In such cases the quantity run in should be very moderate, lest the sudden rise in blood-pressure should overload the already feeble heart. If, after the first pint, improvement in the pulse is not manifest, it is very questionable whether the infusion should be continued.

Experimental work shows that the initial rise of blood-pressure brought about by intravenous saline infusion is followed by a marked fall, so that in shock in particular it is well to supplement it by continuous drip-infusion. Plasma solution if it is obtainable is better for shock than saline. Blood is the best of all.

Great care must be taken that air is not injected with the solution, on account of the danger of an air-embolism.

After-treatment.—Some gauze, wool and a bandage should be applied as dressing. The skin stitches are taken out at the end of a week.

Operation for drip-infusion.—The occasions on which massive infusion is indicated are those of emergency, and chiefly when sudden great loss of blood has occurred, as in some cases of ruptured ectopic gestation. But even in these it is advantageous to supplement the mass injection by subsequent drip, for with saline infusion particularly, the infused fluid soon finds its way through the capillary walls and the blood-pressure falls again. In shock the sudden increment may overload the already struggling heart, and drip infusion is therefore much better than mass infusion, while in peritonitis, suppression of urine and continuous gastric suction, it is infinitely better. Further, it is common practice to continue the effects of blood transfusion by a glucose-saline drip, the same apparatus being employed. The operation for drip infusion is therefore the same as that for drip transfusion, for a description of which the reader is referred to p. 811 and Figs. 597-602.

RECTAL INFUSION

The massive injection per rectum of half to one pint of saline solution or saline-glucose solution made up with common tap water immediately after a severe operation used to be a common practice in the past but it is now superseded by blood transfusion. For continuous rectal drip one of the apparatuses shown in Figs. 597 and 598, pp. 815-816, is the best, a small rubber catheter taking the place of the infusion cannula.

The solution given should consist of one part of normal saline to four parts of tap water. This is a very good way of giving fluid parenterally but is inferior to intravenous drip. It has the advantage, however, that it requires but little skill, and so is eminently suited to difficult conditions.

PERITONEAL ADMINISTRATION

Saline solution may be poured into the peritoneal cavity at the close of an abdominal operation. Since the advent of drip infusion and transfusion this method of supplying fluid has been given up except in infants, for in them the veins are too small to infuse by. Saline can also be injected into the peritoneal cavity through the abdominal wall by means of a needle and syringe.

BLOOD TRANSFUSION

The introduction of blood into the veins has the great advantage over saline or other watery solutions in that it is retained within the vessels and does not percolate through the capillary walls. This is of special importance in conditions in which the patient is very shocked or exsanguinated, for in such the permeability of the capillary walls is much increased. It was supposed that plasma would have the same advantage, but recent research has shown that it is not retained in the blood vessels as blood is. It is inferior to blood, also, in that it does not add to the corpuscular content. Its great recommendation is that it can be stored for some considerable time and be available at a moment's notice when blood either cannot be obtained or involves delay.

The introduction by my colleagues, Marriott and Keckwick, of a practicable method of continuously introducing blood into a vein is one of the major advances of surgery and must already have saved many thousands of lives.

Its use is now almost standard in this country after all operations of any severity, and it has rendered possible the successful performance of operations which, before it was introduced, were utterly impracticable, besides greatly reducing the risks of all other major procedures. In addition, it is used to make fit for operation anæmic and debilitated patients, and to counter certain grave post-operative disasters, and further, it is used in a great number of non-surgical conditions.

Collection of the blood to be transfused.—It is necessary to obtain blood that will not agglutinate the blood corpuscles of the patient. Donors are divided into 4 groups.

- Group AB* Known as the universal recipient, who can receive without danger blood from any man or woman but can give their own blood without danger only to those of their own group.
- Group A* Who without danger can receive blood only from another member of group A or from one of group O, and can only give their blood without danger to a member of their own group or to a member of group AB.
- Group B* Who without danger can receive blood only from another member of group B or from one of group O, and can only give their blood without danger to a member of their own group, or to a member of group AB.
- Group O* Known as the universal donor. People in this group can give without danger their blood to anyone but can receive blood without danger only from a member of group O.

To ascertain to which group a patient belongs a drop of serum from a person known to belong to group A and a drop of serum known to belong to a person of group B are put on to separate slides and with each drop is mixed a drop of the patient's blood diluted with saline solution. If the patient belongs to group AB, agglutination of the corpuscles will take place in both mixtures. If the patient belongs to group A agglutination will only occur with the B serum. If the patient belongs to group B, agglutination will only occur with the A serum. If the patient belongs to group O neither of the mixtures will agglutinate.

Although for practical purposes this is correct, there are occasional discrepancies and, if possible, it is best to have the donor of the same group as the patient and always directly to test the donor's against the patient's blood before proceeding with the operation.

The Rhœsus Factor.—The blood of 15 per cent. of women is Rhœsus negative. Rhœsus positive blood given to such a person provokes an antibody and if at a subsequent period more Rhœsus positive blood is transfused, hæmolysis of the transfused corpuscles, jaundice and sometimes suppression of urine, is caused. Rhœsus group determination prior to transfusion should be carried out:—

- (1) On patients who are likely to require multiple transfusions, or have had a previous transfusion at an interval of more than 7 days.
- (2) On all young women—when feasible.
- (3) On all mothers giving a history of repeated still births or jaundiced babies—95 per cent. of these mothers are Rhœsus negative.

Stored Rhesus-negative blood can now be obtained in all great centres.

Choosing the donor.—In this country there is in most large towns a list of donors drawn up by the Red Cross and divided into these four groups. If such a list is not available nor a donor known to belong to a suitable group, the bloods of several volunteers must be tested directly against that of the patient by letting the patient's blood clot, pipetting off the serum and mixing it with a drop of the volunteer's blood diluted with saline solution.

Bleeding the donor.—The donor must be lying down with his arm on a mackintosh comfortably supported near the edge of the table or bed on which he is lying. The region of the bend of the elbow is cleaned with spirit. Novocaine is then injected over the vein (Fig. 595)

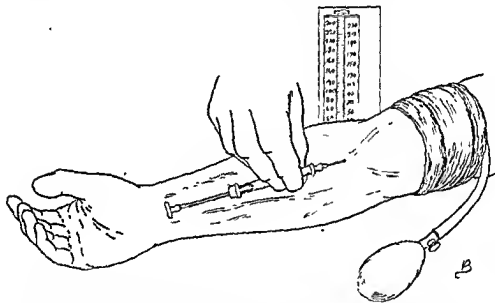


Fig. 595.—Blood transfusion: Anesthetizing the skin of the donor.

which has been chosen and a tourniquet, preferably the bandage of a blood-pressure apparatus, is applied to the upper arm and raised to a pressure between 70 and 80 mm. of mercury.

On a lower level than the donor's arm is placed a Standard Medical Research Council bottle containing 120 c.c. of a 3 per cent. solution of sodium citrate; through the stopper which closes it pass two tubes, to one of which is affixed a French's needle, while the other is plugged with wool (see Fig. 596). Not more than 50 c.c. per 14 pounds of body-weight should be withdrawn. The standard bottle has marked on it two lines indicating 120 c.c. for the citrate solution and 540 c.c. for the level to which the added blood should bring the mixture.

The citrate solution must be absolutely fresh and sterile, and its strength must be correct. French's needle must be spotlessly clean,

since the smallest fragment of extraneous matter (old blood clot, for instance) will produce early clotting.

The needle is made to enter the vein and the donor can, by repeatedly clenching his fist, accelerate the outflow of his blood by the muscular contraction involved (Fig. 596).

The required amount of blood (usually from 400 to 500 c.c.) having

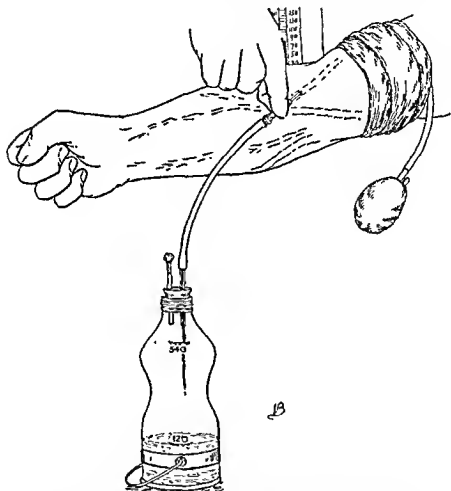


Fig. 596.—Blood transfusion: extracting the blood of the donor.

been collected, the sphygmomanometer is relaxed, a swab is pressed over the needle, which is withdrawn, and the donor is told to flex the elbow gently, which stops any bleeding from the puncture. A small dressing of sterile gauze is then applied.

Failure of the blood to run freely from the vein after it has been punctured may be due to:—

- (1) The needle being pushed through the posterior wall of the vein.

- (2) The tourniquet being too tight.
 (3) Clotting in the needle or tubing.

Administering the blood to the patient. 1. The Medical Research Council's Standard Apparatus.—This consists of a glass bottle with two tubes passing through the stopper which closes it. One of these only

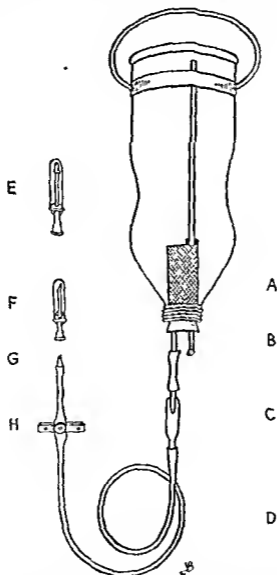


Fig. 597.—The Standard Medical Research Council apparatus. A, Filter; B, Stopper; C, Drip bulb; D, Tubing; H, Clip; E, Cannula in glass container; F, French's needle in container; G, Adaptor.

just perforates the stopper and is connected to a gauze filter, but the other extends almost the length of the bottle. The first tube is connected to a drip bulb, which in turn is connected, by a long rubber tube, to an adaptor to which either a French's needle or a straight metal cannula (with a slightly raised rim about $\frac{1}{2}$ inch from its open

end) can be fixed. A stopcock is placed on the rubber tubing. The tube which goes nearly to the bottom of the bottle is plugged at its outer end with a piece of wool.

The apparatus can be used both for blood giving and for blood taking and also for drip infusion either into a vein or into the rectum, but when used for blood taking the gauze filter and the stopper and tubes just described are changed for a stopper with two short tubes one of which is connected by tubing to the French's needle while the other has its outer end plugged with wool (*see Figs. 596 and 597*).

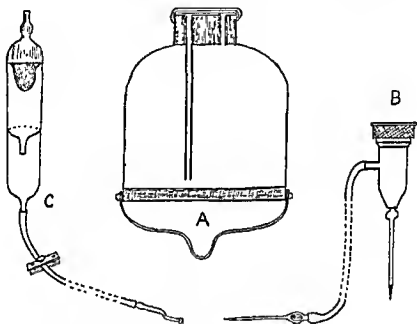


Fig. 598.—"Sterivac" apparatus for continuous infusion and transfusion. A—The flask; B—The valve needle; C—The drip-bulb with gauze filter.

ii. Vacuum apparatus.—There are on the market now several types of vacuum apparatus for infusion and transfusion, and the latest of them (Sterivac) can be used both for withdrawing blood from a donor and for administering it or various solutions to a recipient. It consists of a flask with a rubber cork perforated by two holes through one of which a glass tube passes down to the bottom of the flask. The rubber cork and the holes in it are sealed by a metal cap under which are two sheets of rubber which maintain the vacuum in the flask. For blood transfusion the flask is sold with 70 c.c. of 3 per cent. sodium citrate solution within it. (Fig. 598.)

To take blood, the metal cap is removed and a special needle with a valve is made to perforate the two sheets of rubber. The valve needle

is now connected up by tubing with a Keynes needle and this is pushed into the donor's vein. The valve, which up to now has been screwed up, is opened slowly and the vacuum in the flask aspirates the donor's blood into the flask where it mixes with the citrate solution there. The flask is agitated from time to time to ensure good mixing. The flask will hold 500 c.c. of blood.

To give blood, a sterile drip bulb with a nickel gauze filter is supplied, to which is attached a length of rubber tube ending in a cannula and having a stop-cock on the tube just below the bulb. The filter is removed from the bulb and the sterile saline solution

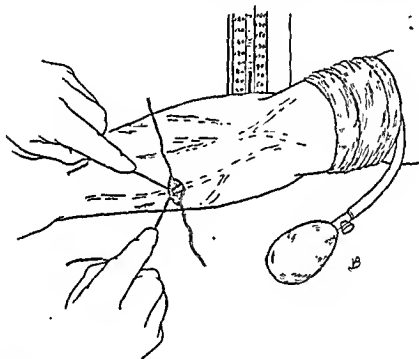


Fig. 599.—Introduction of the blood : Tying the lower end of the vein.

run into it until, with the stop-cock loosened, the solution runs through the cannula. The stop-cock is then closed and the filter replaced. The sheets of rubber over the rubber bung are now torn off and, the flask being held nearly horizontal, the drip bulb is pushed into the hole through which the needle was previously passed when taking the blood. The flask is now inverted and suspended by its handle and, after the stop-cock has been opened, the cannula is passed into and tied in the vein.

For simple infusion the flask is supplied containing the solution required, and all that is then required is to remove the metal cap and rubber sheets, insert the drip bulb, with tube cannula and stop-cock attached, and invert the flask.

Introducing the cannula into the vein.—i. Preparation.—For drip infusion or transfusion, the following operation is usually practised.

A vein in the lower arm should be chosen, as it leaves the patient's elbow free. Exceptionally, it may be necessary to use one of the leg veins. The skin over it is cleaned with spirit, and a tourniquet, preferably the bandage of a sphygmomanometer, is placed on the upper arm at a pressure of between 70 and 80 mm. of mercury to make the veins stand out.

ii. Instruments.—A scalpel, dissecting forceps, light pressure

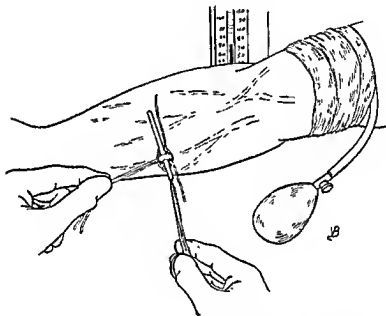


Fig. 600.—Introduction of the blood; Passing tubing under the vein.

("spider") forceps, an aneurysm needle, No. 2 silk, a piece of thin rubber tubing, needles for suture of the skin, a syringe for injecting novocaine, and one of the apparatuses already described (pp. 815-816).

iii. Incision.—A small transverse incision is made over the vein, which is exposed.

iv. Clearing the vein.—The vein is isolated by blunt dissection with forceps, and two ligatures are placed under it.

v. Tying the lower end of the vein.—The lower end of the vein is tied, but before doing so the operator should squeeze as much blood into it from below as may be possible. This is important when the patient is much collapsed, as a full vein is much easier to enter than one flattened like a strap (Fig. 599).

vi. Passing rubber tubing under the vein.—A small piece of thin rubber tubing is drawn under the vein to support it (Fig. 600).

vii. **Introducing the cannula.**—The vein is picked up with forceps and steadied by traction on the ends of the previously tied ligature, and is then opened transversely to its axis with a sharp small scissors (Fig. 601). Directly the vein is opened, as evidenced by the flow of blood, the saline solution in the receptacle should be allowed to flow out of the cannula, thus washing away the blood and making the opening in the vein clear to see. The cannula is then passed in and the second of the two ligatures previously passed is used to tie it in (Fig. 602).

viii. **Loosening the tourniquet.**—The tourniquet is now loosened and, having ascertained that the saline solution is flowing, the surgeon pours the citrated blood into the receptacle and observes the rate of drip by watching and timing the drip bulb and, if necessary, adjusting it correctly by means of the screw clip above it.

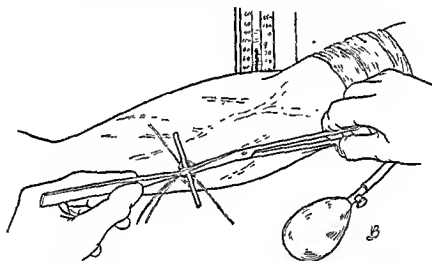


Fig. 601.—Introduction of the blood ; Opening the vein.

ix. **Fixing the cannula.**—The cannula and part of the tube attached to it is now fixed by strapping to the patient's arm.

x. **Rate of flow.**—For a patient who is not bleeding, 40 drops a minute raises the hæmoglobin content 10 per cent. in 4 hours. For patients who have bled severely, a much faster rate is required, especially to begin with, and by opening the screw clip sufficiently the injection can be made practically massive until such time as it is judged that a slower rate of flow will suffice.

xi. **Duration of flow.**—Continuous blood transfusion has been maintained in exceptional cases for a week or longer, but generally two or three days, at the most, sees the patient sufficiently recovered either to change over to glucose-saline or dispense with it altogether.

Difficulties.—The same difficulties arise as with saline infusion. The necessity of all apparatus being spotlessly clean is as great as in

withdrawing blood from the donor. The smallest fragment of extraneous material promotes clotting.

Dangers.—If blood of a wrong group has been inadvertently given serious symptoms will follow :—

1. *Hæmaturia*, caused by microscopical emboli in the kidneys and *hæmoglobinuria* resulting from lysis of the recipient's red blood corpuscles. A 1 per cent. intravenous injection of a solution of sodium bicarbonate is said to benefit.

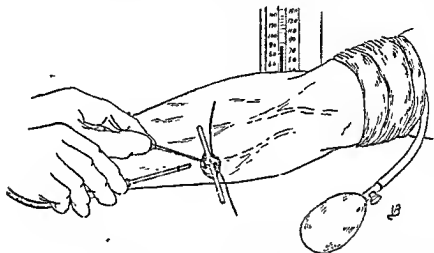


Fig. 602.—Introduction of the blood : Passing the cannula into the vein.

2. *Jaundice* caused by the hæmolysis.
3. *Suppression* or partial suppression of *urine*. (See p. 900.)
4. *Rigors*.
5. *Collapse* and *dyspnoea*. A solution of 1/1000 adrenalin should be given hypodermically.
6. *Pulmonary œdema*. This is the result of giving too much fluid rapidly especially if it contains too much salt.
7. *Rhesus reaction* (see p. 812).

PLASMA TRANSFUSION

Plasma has been employed with considerable success in the treatment of shock. Plasma is prepared by allowing citrated blood to stand, after which the supernatant plasma is decanted. Filtration and removal of agglutinins completes the process. Storage for several months does not detract from its properties and herein lies its great advantage. Its administration is most suited for traumatic shock when there has been little or no loss of blood. Quantities from 1 to 4 pints may be required to restore the blood-pressure. It is given in

the same manner and with the same apparatus as drip blood transfusion.

Plasma is not retained in the vessels as well as blood, but it has the advantage that, when stored in the dry state, it can be kept for a long time and is instantly available.

PROTEIN INFUSION

To counter excessive loss of protein such as occurs in starvation or from large raw surfaces as the result of burns or surgical operations, protein digests or hydrolysates such as "Casydrol"* are now prepared in a form suitable for intravenous infusion and are increasingly employed.

* Genatosan—Benger.

CHAPTER XXXII

POST-OPERATIVE COMPLICATIONS

VOMITING

POST-OPERATIVE vomiting may be considered under the following headings :

1. Anæsthetic vomiting.
2. Irritative vomiting.
3. Neurotic vomiting.
4. Peritonitic vomiting.
5. Obstructive vomiting.
6. Vomiting due to acute dilatation of the stomach.
7. Vomiting due to pylephlebitis.

1. **Anæsthetic vomiting.**—This occurs soon after the patient has been put back to bed. It is dependent partly on the patient, partly on the nature of the anæsthetic used, partly on the experience of the anæsthetist, and partly on the method of preparation of the patient. It is a matter of everyday observation that patients vomit much less when the anæsthetic is administered by one experienced in this class of work, and also that if an anæsthetic is administered before the stomach is empty, vomiting will most likely ensue. Of the anæsthetics given by inhalation, ether is the most provocative of vomiting, and nitrous oxide and oxygen the least. The modern basal anæsthetics lessen vomiting because they reduce the amount of the anæsthetic to be inhaled. Anæsthetic vomiting, as a rule, does not last more than 24 hours. It takes the form, not infrequently, of the patient trying to be sick rather than actual vomiting. The retching is distressing and the quantity voided is a small quantity only, a draught or two at a time. There is not any tenderness of the abdomen or rise in temperature, and the vomited matter consists of bile-stained fluid.

The nurse should stay by the patient and keep her from being soiled by any ejected material. The patient should be placed on her side or her head turned to one side.

2. **Irritative vomiting.**—This is due to a gastritis set up by the anæsthetic. The contents of the stomach are persistently ejected, but vomiting is not so likely to occur if the viscus be left alone and not continually worried by having milk or beef-tea poured into it. Irritative vomiting is often combined with flatulent gastric distension, and pain

referred to the left thorax. Large quantities of bile may be brought up—the so-called “bilious” vomiting. Abdominal tenderness is absent, as also fever and undue rapidity of the pulse.

The treatment is to peptonize the milk, or to add to it lime-water.

This prescription will be found useful :

R Sodii bicarb. ʒj.
Ess. menth. pip. ℥v.
Aq. calid. ad ʒiij

To be administered half an hour before the next feed.

This draught, which at times makes the patient very sick, and so effectually washes out the stomach, often gives great relief.

The following also may be tried :

R Bismuthi carb. gr. v.
Mag. carb. levis gr. x.
Sodii bicarb. gr. xv.
Aq. destil. ad ʒj.

The draught to be taken every 3 hours if necessary.

If the vomiting prove obstinate, feeding by the mouth should be stopped for 24 hours, and rectal injections of glucose saline solution (p. 811) administered meanwhile. An enema to open the bowels is often successful.

Irritative vomiting does not, as a rule, last more than 24 hours. It is not at all uncommon in the more severe cases of irritative vomiting for the ejected material to be coffee-coloured from the presence in it of altered blood, derived probably from the congested stomach-wall. In the absence of unfavourable abdominal symptoms, this occurrence need not cause alarm.

3. **Neurotic vomiting.**—This is often combined with the foregoing, but when due to neurosis pure and simple it may be very troublesome. The patient is continually retching, whether food be in the stomach or not—she is obviously trying to be sick. She often complains of great agony ; there is much excitement and loss of sleep. There are no other signs suggesting anything amiss : the pulse-rate is not quickened to any marked degree ; abdominal distension is absent and the quantity of the fluid evacuated does not increase ; in fact, the presence of neurotic vomiting is usually noticed in those in whom there is the least likelihood of any grave lesion of the bowel or peritoneum. We have found that the addition of a little brandy to the food often tempts the patient to retain it, as in these cases there may be a craving for alcohol or morphia. Neurotic vomiting can be troublesome for several days, and if not relieved the patient may be much exhausted. The remedies mentioned under “irritative vomiting” above can be tried, and in addition relief may sometimes be obtained by counter-irritants, such as an ice-bag, mustard-plaster, or blister over the epigastrium. Drop-doses of tincture of iodine in a teaspoonful of hot water every half-hour, iced champagne, very strong coffee without milk, an enema of 20 grains of chloral hydrate in 3 ounces of water—all these may relieve the patient, or, on the other

hand, may not be of the slightest use. If the condition becomes very troublesome, relief will only be obtained by stopping all food by the mouth, washing out the stomach, and opening the bowels by a simple enema of soap and water.

If the patient is very excitable morphia gr. $\frac{1}{3}$ will very often change the aspect of affairs entirely, and the patient will wake up relieved of this troublesome symptom.

It is extremely important that the surgeon should not overlook an organic cause for the vomiting. We have seen several cases in which persistent vomiting due to an intestinal kink continued for several days without the slightest abdominal pain or distension. When there is the smallest doubt as to the nature of the vomiting, it is safer to adopt the graver diagnosis.

4. **Peritonic vomiting.**—This supervenes during the second or third day following the operation. The vomiting is at first infrequent and the amount small, while the ejected material is pale brown in colour. Later it is a darker brown or green, and sometimes slightly offensive. There is not, however, any feeling of sickness or effort to eject the fluid as in the case of irritative vomiting; the fluid simply wells up and flows out of the mouth. The other signs and symptoms which accompany peritonitis are, as a rule, so evident that the cause of the vomiting cannot be mistaken.

The treatment will be described under Peritonitis (p. 842).

5. **Obstructive vomiting.**—The obstruction may be due to many causes, all of which are discussed on p. 848, but whatever the cause, the result is the same. The vomiting may come on quite gradually, so that for the first two or three days the patient may apparently be progressing quite satisfactorily. Later the vomiting, which at first is only intermittent, gradually increases in frequency, till at last it is practically continuous. The vomit is of a dark brownish-yellow colour, with a sour, unpleasant smell, is very copious, and out of all proportion to any fluid that has been ingested by the stomach. Its character at once indicates its *intestinal* origin. Often the ejected material does not become truly faecal in character until the end is at hand, unless the obstruction is very high up, and in many instances it does not become so at all. Obstructive vomiting is always accompanied by distension, which gradually becomes more and more marked.

In obstructive vomiting it is most important to note that the large amount vomited is out of all proportion to any fluid that may have been introduced into the stomach by the mouth, while its character shows that it is not the normal secretion of the stomach and upper part of the duodenum, but suggests an acute bacterial invasion of the stomach and intestinal wall, resulting in a copious watery secretion therefrom. The faeculent odour of obstructive vomiting is due to acute infection of the upper intestinal tract by intestinal bacteria.

6. Vomiting due to acute dilatation of the stomach.—See p. 868.

7. Vomiting due to pylephlebitis.—See p. 864.

DISTENSION

Abdominal distension after operation is either (1) epigastric, (2) flatulent, (3) parietic, (4) obstructive, or (5) peritonitic.

1. **Epigastric distension.**—This is due to gaseous distension of the stomach and is often associated with irritative vomiting and owns the same cause. It is obviously gastric, and the treatment suggested for irritative vomiting (p. 822) may be tried. If these measures fail, the remedies recommended under neurotic vomiting (p. 823) may be used.

A distended transverse colon may be mistaken for the stomach if the abdomen be examined without the bandage being unfastened. This would be a serious error, since a distended colon has a very different significance. Gastric distension, when extreme, is due to acute dilatation of the stomach (see p. 868).

2. **Flatulent intestinal distension.**—Almost all abdominal sections are followed within 48 hours by a functional disturbance of the intestine manifested by irregular painful peristalsis and flatulent distension which is largely independent of the position of the operation area. It always begins in the stomach and upper intestine and thence gradually passes downwards until flatus is passed *per anum*, which rarely happens until 48 hours or more have elapsed since the operation. The process is accompanied by colicky wind-pains and a very distressing sense of distension and, in its earlier stages, by frequent belching.

The subject is still very imperfectly understood. The source of the intestinal gases is threefold:

(1) Air swallowed;

(2) Gas diffused into the lumen from the intestinal blood-vessels; and

(3) Gas produced by fermentation of the liquid intestinal contents.

The mechanism whereby the gas is prevented from becoming excessive is twofold:

(1) Absorption through the vessels of the intestinal wall, and

(2) Expulsion by peristalsis *per oram* and *per anum*.

The clinical features of typical post-operative distension suggest a charge of gas which, rapidly accumulating in the stomach and upper intestine, is passed downwards by peristalsis until it is expelled. Whether increased production or diminished absorption is the primary factor in the accumulation is not known but it is obvious that the normal mechanism of gas balance is disturbed by the mere opening of the peritoneal cavity, possibly because the pressure conditions in it are altered.*

* Victor Bonney. "The functional derangement of the intestine which follows abdominal operations". Bradshaw Lecture, R.C.S., *Lancet*, Dec 15, 1934.

Post-operative flatulence tends to be worse the more severe the operation and particularly if the intestines have been much exposed or roughly used, and it is greatly increased by certain untoward occurrences such as post-operative oozing, peritonitis or the formation of a red infarcted area such as follows the use of suboccluding ligatures (see p. 42) or other causes of partial interference with the blood supply to a portion of tissue.

Treatment.—In many cases the symptoms are so slight that the surgeon can safely wait for the natural passage of gas *per anum* which brings relief. When, however, no such passage has occurred after 48 hours, or when the patient's pain and discomfort are considerable, the use of the rectal tube is often very successful and this should be tried first. If flatus is not got away by this means, a glycerin enema, repeated if necessary, is generally very efficacious. Inexperienced persons often treat this kind of case by administering an aperient, but it is a dangerous thing to do, for symptoms deemed due to simple functional disturbance may in reality be those of incipient intestinal obstruction, which an aperient will rapidly make absolute. It is a good rule never to give an aperient until the state of the abdomen is entirely satisfactory. If the griping is severe, and particularly in those cases in which there is much painful peristalsis but little distension, a hypodermic injection of morphia gr. $\frac{1}{2}$ soon brings relief.

When the measures described have failed to reduce the distension and make flatus pass, more active means should be used to get the intestine into working order again, lest the distension pass into that more severe form to which the word parietic is applied. Acetylcholine has been shown by Dale to be the link that connects the nerve endings in muscle with the muscle fibres themselves. Prostigmine, besides being a muscle stimulant, inhibits esterase hydrolysis of acetylcholine so that the two should be used in combination. An ampoule of each is given hypodermically and 15 minutes later is followed by a glycerin enema. This treatment is the most powerful intestinal stimulant we at present possess, and may be repeated every 4 hours.*

In addition, or as an adjunct to this treatment, rectal wash-outs and other forms of enemata besides glycerin are available.

Rectal wash-out.—To wash out the rectum a long rubber rectal tube is passed with a glass funnel fitted to its free end. Two pints of saline solution at a temperature of 105° F. should be prepared and 10 ounces is poured into the funnel, which is held as high as possible. The fluid is allowed to remain in the rectum for a few minutes after which the funnel is lowered into a basin of boric acid solution and the injection allowed to run out, with consequent aspiration of flatus from the bowel. Ten more ounces are then run in until the 2 pints is used up. This

* Di isopropylfluorophosphonate known as DFP, is stated by some American workers to be more efficacious than prostigmine in preventing esterase hydrolysis and it sensitizes the bowel to the action of prostigmine.

method is often very successful and has the advantage over large enemata that it does not exhaust the patient so much.

Enemata.—A glycerin enema consists of 1 ounce of glycerin and 4 ounces of water given through a large catheter with a funnel attached. For general use it is the best of all enemata because it does not cause the disturbance and pain that large enemata do. A turpentine enema consists of turpentine, \mathfrak{ss} , castor oil, $\mathfrak{z}\mathfrak{i}$, and soap and water $\text{O}\mathfrak{i}$, and is made either by mixing the turpentine in a porringer with a piece of soft soap as large as a hen's egg, then stirring in the oil and then adding the water; or by beating up the turpentine with the white of an egg and then stirring in the other ingredients. The enema should be injected at a temperature of 102° F.

A rue enema consists of *Olei rutæ* \mathfrak{m} xx ; mucilage of acacia $\mathfrak{z}\mathfrak{i}\mathfrak{j}$; soap and water ad $\mathfrak{z}\mathfrak{v}\mathfrak{j}$.

An ox-gall enema is another good stimulant of peristalsis.

3. **Paretic distension.**—There is no hard-and-fast line to be drawn between ordinary post-operative distension and that due to partial or complete functional obstruction. It is a matter of degree and persistence. In regard to degree it should be remembered that after the removal of large tumours and after Cæsarean section the abdominal wall is so much relaxed that a high degree of flatulent distension may exist without the patient being incommoded by it, while on the other hand the strong, rigid abdominal wall of a young nulliparous woman accentuates the effects of intestinal distension. As regards persistence, flatus should have passed *per anum* in from 48 to 60 hours after the operation; when the passage is delayed longer than this a degree of intestinal inertia or intestinal obstruction is to be suspected or actually inferred according to the symptoms. A rising pulse-rate, continual discomfort or distress, and vomiting beginning long after the effect of the anæsthetic has passed off are ominous. Persistent flatulent distension is dangerous, also, in that it may be the immediate cause of organic obstruction by putting a strain on a small kink or adhesion which in the absence of distension would do no harm, but which, being pulled upon, blocks the passage way. Also, when intestinal distension has reached a degree high enough markedly to raise the intraperitoneal pressure, the distended coils begin to kink one another and organic obstruction is added to functional obstruction. When the abdominal wall is very lax, as after Cæsarean section, a much greater degree of distension is possible without this happening and, conversely, when the abdominal wall is firm and strong the kinking effect is promoted.

The treatment of paretic distension and obstruction is discussed on p. 857.

4. **Distension of organic obstruction.**—The distension caused by organic blockage is, at its beginning, usually more localized than that caused by paretic (functional) obstruction, particularly if the

obstruction be situated in the pelvic colon. The griping pain is more severe and accompanied by very audible borborygmi, the course of which may be followed during inspection of the abdomen, when perhaps visible peristalsis may also be observed. The patient can often indicate the point at which the painful contractions appear to stop.

The distension is hard, and all the measures detailed on p. 826 fail to open the bowels or to secure a satisfactory passage of flatus. Moreover, the patient begins to vomit and is quite clearly losing ground. With organic blockage, severe attacks of colicky pain come on at intervals, and the intestinal contractions may be seen, felt and heard. With functional obstruction, colicky pains may be present, but are rarely so severe. When the whole length of the intestine is paralysed, intestinal movement cannot even be heard with the stethoscope. It must be remembered that organic blockage sometimes comes on very late and insidiously, so that at first flatus and even bits of faecal matter may be passed.

For a further discussion of the symptoms of intestinal obstruction and its treatment, see p. 848.

5. Peritonitic distension.—This form of distension, when the peritonitis causing it is acute and general, is diagnosed with greater ease, accompanied as it is by marked pain, rigidity, and early collapse (see p. 843). Intravenous saline-glucose infusion combined (if vomiting is a feature of the case) with continuous gastric suction is indicated. To reduce the distension rectal wash-outs and the administration of intestinal stimulants are useful measures, in addition, the treatment described in the section dealing with peritonitis (p. 844), should be prescribed.

In conclusion, we would stress the value of continuous intravenous saline-glucose infusion in the treatment of obstinate vomiting and distension. After giving an extended trial to all other methods, we have found that this procedure is more generally useful than any other. If the vomiting be simply irritative, the stomach is rested; if it be due to partial obstruction, parietic or otherwise, the bowel has time to recover itself; if to peritonitis, peristalsis is minimized, and thereby assists in keeping the inflammatory process localized to the operation-site; and the same advantages apply to obstinate distension.

We resort to this method of treatment early in any case of vomiting or distension that does not rapidly improve under the other measures we have indicated. Its application is also of considerable diagnostic value, since vomiting which continues in spite of the rigid exclusion of everything from the stomach is of very bad import.

PAIN

Following all abdominal sections, patients complain, more or less for at least 24 hours, of pain in the incision and along the lower ribs,

and in the back due to the position they were placed in during the operation. The pain should then rapidly subside, so that at the end of 48 hours the patient is much easier. Pain in the ribs and back can be greatly relieved by placing an air-cushion under the back and a pillow under the legs, which causes the back to lie flat on the bed, and not arched as is otherwise the case.

Pain in the incision is most marked in procedures involving tension on the stitches, such as operations for ventral herniæ.

The single-layer method of closing the abdominal wound results in more pain than the three-layer method, and an incision through the abdominal muscles more than one through the *linea alba*.

In appraising the significance of pain after an abdominal operation, the nature of the operation and the character of the patient must both be taken into account. When, within the first 24 hours the pain is not explicable on these grounds, and is accompanied by undue rapidity of the pulse-rate, some disaster at the operation-site is to be suspected, such as recurrent hæmorrhage, which is always associated with severe pain; the escape of intestinal contents through an unnoticed perforation of the bowel; or bleeding into the deeper layers of the abdominal wound; or even the latter giving way.

If the pain appears after 24 hours, it is probably due to flatulence, peritonitis, or obstruction, and its treatment is discussed at pp. 826, 844, 855 and 857.

The amount of pain normally following a vaginal operation varies. After such procedures as eurettege or amputation of the cervix there should be none. Posterior colporrhaphy always results in a certain amount of pain which is usually referred to the rectum. The pain, however, should not be severe and when it occurs hæmorrhage under the vaginal wall is to be suspected if it comes on at once, and suppuration round the sutures if it comes on after the lapse of several days.

For many years now we have prescribed morphia freely after abdominal section, the old idea that it produces flatulence and intestinal paresis being devoid of foundation. One sixth of a grain is given hypodermically directly the patient is roused from the anæsthetic, and this dose is repeated as often as is required to keep the patient comfortable for the first 24 hours, but not at shorter intervals than 4 hours. During the second 24 hours the patient can usually be kept comfortable by aspirin or veganin, but if this is not sufficient morphia is again given. After 48 hours from the operation morphia is less likely to be required if all is going well, but there is no objection to continuing its use. After vaginal operations, morphia should be given if aspirin does not alleviate the pain sufficiently. Heroin or omnopon may be substituted for morphia if they suit the patient better. Some persons cannot take any

of these narcotics, in which case the surgeon will have to fall back on one of the morphia substitutes now obtainable or on aspirin or vegamin, but these are poor pain-killers compared with morphia.

INSOMNIA

After the first 24 hours a patient who is doing well should sleep, at first in short snatches and subsequently for longer periods.

Persistent insomnia is of bad import. When peritonitis, intestinal obstruction, or similar causes of pain are present, sleep is impossible. In the absence of pain, insomnia is seen in highly nervous patients, especially when exposed to the necessary disturbances which occur in a hospital ward. It is also seen as a precursor of post-operative insanity. Most characteristically of all, however, it occurs in conditions of toxic absorption, as, for instance, with subacute inflammation round the ligatures at the operation-site. In such cases, also, sleep, though not absent, may be rendered distressing by nightmare-like dreams. Such occurrences are most suggestive of something amiss in the operation area.

As treatment, morphia is not satisfactory, except when pain is present. In the absence of pain, aspirin, medinal, allonal, dial, sulphonal, and bromidia are all useful. What will suit one patient may not suit another.

OPERATIVE SHOCK

The causes of operative shock are best discussed under the heads—(1) predisposing causes and (2) immediate causes.

1. Predisposing causes.—A deteriorated state of the patient's health is a most important predisposing cause of operative shock. The worst patients of all in this respect are those who have been suffering for some time beforehand from hæmorrhage or toxic absorption, or both combined, e.g. advanced cases of carcinoma of the cervix.

Fear of the operation diminishes resistance, and hence very nervous patients are more likely to suffer from shock than those who are stouthearted.

2. Immediate causes.—There are three varieties of shock: traumatic, hæmorrhagic and toxic, but the last of these we will discuss later on. Traumatic shock is due to the reception by the nervous centres of destructive sensory impulses originating in the area in which the tissues are being subjected to trauma. The outcome is a disturbance of the vaso-motor system, whereby the propelling force of the heart is diminished, the arterial blood-pressure falls, and the blood accumulates in the splanchnic veins. As a consequence, the injured nerve centres receive a diminished blood-supply, whereby they are additionally damaged, and a vicious circle is established which ends in complete vaso-motor paralysis and a degeneration of the walls of the arteries and capillaries, whereby their normal impermeability to colloids is lost.

In cases of pure traumatic shock, i.e. those in which hæmorrhage has not played any part in the patient's condition, the heart is at first slowed. This phase may last only a very short while, or for some hours. It is followed by a quickening which may signify the beginning of recovery, in which case the arterial tension rises also, or the onset of cardiac failure, in which case the arterial tension falls still lower. A patient suffering from traumatic shock is pale, even to blanching, and cold, because of the diminished quantity of blood in the cutaneous vessels, but with the pallor is mixed a certain bluish tint, most noticeable in the lips and mucous membranes generally. The subcutaneous veins, unlike the arteries, are full of blood, a point wherein the effect of traumatic shock differs absolutely from that of hæmorrhage.

In by far the larger number of cases of post-operative shock, however, the state of the patient is due not solely to the effect of traumatic shock impulses conveyed along the nerves, but to the effects of undue loss of blood as well.

The effect of hæmorrhage differs from that of trauma in these particulars, that it quickens the pulse-rate from the first, and that the fall in the arterial tension is primarily due not to a local diminution of the blood-content of the arteries, but to a diminution of the blood-content of the body generally.

The bleeding which may thus complicate traumatic shock does not necessarily take place during the operation; it may have been largely pre-operative, so that the small loss occurring during the operation is able to tip the balance the wrong way.

On the other hand, we have often noticed that plethoric patients stand loss of blood much less well than many anæmic patients. The former lose much more during the operation, but this might be supposed to be balanced by the larger amount they possess at the outset. This, however, is not so; probably their cardio-vascular mechanism has become accustomed to work under plethoric conditions and cannot readily readjust itself, whereas the mechanism of the chronic anæmic has more or less adjusted itself to work with a deficient quantity of blood.

Acute anæmia, the result of rapid bleeding, presently produces results very similar to those of traumatic shock, for the nerve centres, starved of blood, undergo degeneration, and the fall of arterial blood-pressure, at first due to depletion of the blood-vessels, is now accentuated by vaso-motor failure, and this is soon followed by degeneration of the walls of the smaller vessels whereby they lose their normal impermeability to colloids. Such may be called hæmorrhagic shock.

This is well seen in cases of ruptured extra-uterine gestation. If such a case be operated upon at once, before the vaso-motor mechanism and vessel-walls have had time to degenerate, saline venous infusion has the happiest effect; the blood-pressure rises, the heart-beat becomes stronger and slower, and the patient rapidly recovers. But if, on the

other hand, interference be delayed for 24 hours or more, this result will not be achieved. In such cases saline infusion has little or no effect; the vaso-motor mechanism cannot be stimulated, and the infused fluid is not retained within the now abnormally permeable vessel-walls.

It may be objected that in these delayed cases bleeding has been going on for a longer time, and that, therefore, such patients have lost more blood than those who are operated on immediately. This, however, is not so. In most of these delayed cases the hæmorrhage has been relatively moderate and slow, and at the operation it is found not only that bleeding has stopped but that it must have done so spontaneously many hours before, thus accounting for the equivocal symptoms which caused the delay in diagnosis and treatment. In short, the average amount of blood found in the peritoneal cavity is considerably less than that found in those fulminant cases in which the symptoms of internal hæmorrhage are so obvious that an operation is performed without delay, and yet the prognosis in the latter class is infinitely better than in the former.

Cases of operative shock may, therefore, be clinically divided into three groups:

1. Those in which the condition is due purely to traumatism.
2. Those in which it is due purely to hæmorrhage.
3. Those in which it is due to a combination of both these factors.

The first group, other things being equal, has the best prognosis: the pulse-rate is often subnormal throughout: a most hopeful sign, for slow cardiac action is conservative.

The second group is intermediate in gravity. The heart beats fast, using up the cardiac strength, but on the other hand infusion, either of glucose-saline solution or better still blood, if carried out at once and with judgment, will probably succeed in restoring the content of the vessels before the later effect of hæmorrhage on the neuro-vascular mechanism and permeability of the capillary walls has time to materialize.

The third group is the most serious; the patient lies cold and relaxed, the temperature is subnormal, the respiration ominously fast and shallow, the skin is bathed in cold sweat, and occasionally there is vomiting and loss of sphincter control. The mental condition is not markedly dull, and sometimes is even alert with great restlessness, anxiety of impending death being expressed. A very common remark made by the patient is that she feels as though she is "sinking through the bed."

TREATMENT

Prophylactic.—If the health of a patient is deteriorated from loss of blood, septic absorption, or other causes, and the operation being likely

to be attended with shock, is not of immediate necessity, she should be given appropriate treatment and her health improved as much as possible before the operation is undertaken. On the other hand, if a patient is extremely nervous and dreading the operation, the liability to shock may be greater if much time is spent in such pre-operative treatment than if she is operated on forthwith. The pre-operative use of violent purgatives is specially to be avoided in patients who are anæmic from loss of blood or are suffering loss of body fluid from any other cause. If the patient is sleeping badly, a hypnotic should be given the night before the operation and, fading some contra-indication, a hypodermic injection of morphia, gr. $\frac{1}{2}$ or $\frac{1}{4}$, together with atropin gr. $\frac{1}{100}$, should be administered half an hour before the operation unless one of the basal analgesics is to be administered before the anæsthetization, when atropin alone should be given.

The theatre should be warm (about 70° F.), and the patient should be clothed in a warm jacket and leggings.

If the operation will certainly, or may possibly, produce shock, the following are the effects which the surgeon must try to achieve :

1. To reduce shock-impulses to the minimum compatible with the proper performance of the operation.
2. To prevent such shock-impulses as are unavoidable from reaching the higher centres.
3. To reduce the amount of blood lost during the operation to the smallest quantity possible.
4. To take steps to combat the effect of the unavoidable loss of blood.

The operation should be performed as gently as possible. Light-handedness in handling the tissues, and in particular the intestines, the use of soft swabs wrung out in saline solution for packing off the intestines, the avoidance of dragging on the mesenteries and of undue retraction of the parts, greatly diminish the likelihood of shock. The operator should cut and snip the tissues, and not employ the quicker and rougher method of tearing, pushing and pulling upon them. Eventration of the intestines is a procedure particularly likely to give rise to shock, and if, on account of some technical difficulty, this has to be done, the intestines should be kept warm and moist by covering them with towels frequently soaked with warm saline solution.

The relation of shock to the amount of time taken over the operation depends not so much on the time as on what is done during that time (see p. 3). Thus, if an operator is slow but careful, his patient will not suffer nearly so severely from shock as if the operation had taken a third of the time but the operator had been clumsy.

In cases in which prevention of shock is of paramount importance, spinal anæsthesia should certainly be employed, not only because it prevents shock-impulses reaching the higher centres, but also because

it produces extreme relaxation of the abdominal parietes and thus facilitates gentle manipulation on the part of the surgeon. If spinal anæsthesia alone is employed so that the patient retains consciousness, emotional shock-impulses arising in the cerebrum, as the result of fear and mental agitation, may go far towards counterbalancing this advantage. Many patients under spinal anæsthesia only, after the operation has lasted some time, become faint, nauseated and often vomit. We think, therefore, that general anæsthesia should be employed in all shock-producing operations as an adjunct to spinal anæsthesia (see p. 83).

In some regions of the body the use of infiltration anæsthesia minimizes shock very markedly, but it is not generally applicable to abdomino-pelvic surgery, in which, for anatomical reasons, the operation-area cannot, as a rule, be satisfactorily infiltrated.

The reduction of the amount of blood lost to the smallest quantity possible is most important in operations likely to be followed by shock, and all hæmorrhage so soon as it occurs should be arrested if possible, even from the small vessels opened by the abdominal incision.

In certain of the operations likely to be followed by shock, however, complete arrest of hæmorrhage *pari passu* with the steps of the operation is practically impossible. Certain advanced cases of carcinoma of the cervix are a good example of this. In them a constant oozing goes on from the indurated and vascular tissues which cannot be arrested by ligature or pressure with the forceps. It is in such cases that the rapid operator has a great advantage over his slower colleague.

To obtain an idea of the amount of blood lost during certain operations, we weighed the swabs used, both before, when they were dry, and after each operation, in 123 cases. The following table shows the maximum, minimum, and average loss of blood in some of the principal gynæcological operations:

Operation.	Number of cases.	Maximum amount lost.	Minimum amount lost.
Total abdominal hysterectomy	9	15 oz.	7 oz.
Subtotal abdominal hysterectomy	31	59 "	2 "
Radical abdominal hysterectomy	23	39 "	15 "
Ovariectomy	19	9 "	1 "
Salpingo-oophorectomy	15		2 "
Intraperitoneal shortening of the round ligaments	12		2 "
Ventralfixation	14		2 "

The largest quantity of blood lost, 59 ounces, was in a very difficult case of hysterectomy for a cervical fibroid which weighed nearly 26 pounds. - Omitting this case, the average amount lost in 30 subtotal hysterectomies was 9 ounces.

To maintain the blood-pressure during an operation and to make up for the blood unavoidably lost, continuous intravenous infusion of blood should be employed, the rapidity with which it is introduced being varied according to the patient's condition and the transfusion being continued as long after the operation as may be necessary.

With regard to the effect of the anæsthetic on the amount of blood lost during the operation, ether administered by the open method, while it has the advantage that it is a strong cardiac stimulant and is much less toxic to the tissues than chloroform, has the disadvantage that it certainly keeps at a maximum that oozing of blood which is to a greater or lesser extent unavoidable during an operation. Gas and oxygen also promote bleeding. Thus, in a general way, it may be said that ether or gas and oxygen is preferable if traumatic shock is anticipated, while either chloroform or spinal anæsthesia, both of which lower the blood-pressure (the latter very markedly) is better if the principal risk of the operation is hæmorrhage during its progress. This is where the experienced anæsthetist is of assistance, for by varying the anæsthetic he uses he materially assists in the prevention of shock.

Curative.—Given that shock is present, certain general measures must be taken, and besides these there are others having as their *rationale* a specific object.

General measures.—The patient must be kept warm by having the room properly heated and by means of hot-water bottles, suitably protected, in the bed. A still better method of achieving this is by a large covered bed-cradle warmed by a series of electric lights within it: the warm-air bath (*see* p. 913).

Pain increases shock; if, therefore, there is complaint in this respect it should be controlled by morphia. Mental excitement, fear, and agitation all help to use up the patient's strength, and here again the use of morphia is valuable.

Specific measures. 1. *To maintain the strength of the heart.*—It has been pointed out that in pure traumatic shock a subnormal pulse-rate is often present. This in itself is favourable, because the cardiac energy is conserved, and nearly all cases of operative shock exhibiting this feature recover. Hæmorrhage being a factor in most cases of operative shock, however, the pulse is usually fast throughout. The cardiac reserve is thus greatly taxed, and unless the rate can be slowed or the heart's strength maintained the appearance of cardiac failure is merely a matter of time. For the treatment of cardiac failure, *see* p. 862.

2. *To raise the blood-pressure.*—The arterial blood-pressure is low,

partly because the heart-beat is deficient in strength, partly because there is a vaso-motor disturbance and, when hæmorrhage is a factor in the condition, partly because the total blood-content is deficient. The surgeon must try to determine in any particular case which of these factors is the predominant one.

The methods which may be tried to raise the blood-pressure are first to strengthen the action of the heart, second to stimulate the vaso-constrictor centres, and third to increase the fluid-content of the vessels.

The drugs that may be used to stimulate the heart are dealt with on p. 862. Of those which act on the vaso-constrictor mechanism, adrenaline, ephedrine hydrochloride and coramine are the strongest. Pituitrin in doses of 1 c.c. has been very largely used in the treatment of shock. Our experience of this drug is that its benefit is more theoretical than practical. If the vaso-motor centres are badly exhausted it produces no effect. Moreover, it is useless to raise the blood-pressure by vaso-constriction unless the strength of the heart can be increased at least proportionately, for otherwise the burden on the heart is merely increased.

The fluid-content of the vessels is most directly increased by intravenous infusion of blood, plasma, or saline-glucose solution. In cases of post-operative shock, chiefly due to trauma, the amount of fluid massively infused should be very moderate—not more than a pint—for the total blood-content of the vessels, though ill-distributed, is but little diminished. Because of this, and to give the circulation time to adjust itself, drip infusion is as a rule better than mass infusion. Saline-glucose is almost as good as blood or plasma in these cases.

When, however, the shock is chiefly hæmorrhagic, the amount massively infused should be considerably greater, up to 2 pints. In hæmorrhagic shock, saline solution, *if infused at once*, is almost as effective as blood. If, however, infusion is delayed until the capillary walls have largely lost their impermeability, saline solution will not be retained in the vessels. In hæmorrhagic shock mass infusion up to 2 pints should be given at once, but after this the flow should be reduced to a drip. Blood is preferable to glucose-saline in all cases if it can be administered without delay.

The question of administering intravenous infusion in shock is a matter for the nicest judgment. Its unintelligent use may overload the weak heart. When the pulse-rate is slow, reliance should be placed on coramine, alcohol, and morphia. It is easy to kill these patients by over-zealous treatment (*see also* p. 830).

Rectal saline-glucose injections can be employed, particularly in cases in which the operation has been one which does not involve an acute loss of blood. This method, being slow, has the advantage that it gives time for the heart to accommodate itself to the increased

quantity of fluid, which is absorbed into the vessels *pari passu* with the needs of the circulation and the capability of the heart.

3. *To keep the vital centres supplied with blood.*—To this end the patient should be tilted by raising the foot of the bed. Oxygen should be given in cases of severe shock. It stimulates the heart, relieves the respiration, and helps to conserve the patient's strength.

In conclusion, we would repeat that it requires the greatest judgment to determine the best treatment in any particular case of shock, and that in the course of our experience we have known as many lives lost from doing too much as from doing too little.

POST-OPERATIVE HÆMORRHAGE

Hæmorrhage following soon after an operation may be due to a slipped ligature or to oozing from a raw surface, a stitch-hole or a sub-occluded pedicle (*see p. 42*). When it occurs after many days, it is usually due to septic necrosis opening into a vessel ligatured at the operation.

The blood may escape into the peritoneal cavity or into the sub-peritoneal tissue or elsewhere. It is a point worthy of notice that bleeding under the peritoneum produces symptoms out of proportion to the amount extravasated, which may be relatively small. In these cases the bleeding is slow and the characteristic symptoms of hæmorrhage are late in appearing, and the condition is at first likely to be mistaken for traumatic or toxic shock.

A slipped ligature very rapidly gives rise to symptoms and signs of loss of blood. The pulse-rate becomes very fast, the patient is white, cold, restless, complains of much pain, and the temperature is subnormal.

On the other hand, slow oozing may be very deceptive, so that peritonitis or intestinal obstruction is mimicked. The abdomen becomes distended and tender, and there is often marked pyrexia. The increasing pallor of the patient in these cases should warn the surgeon of the possible nature of the disaster. Occasionally a slow pulse-rate and raised temperature are seen with intraperitoneal hæmorrhage. When, however, the cardio-vascular compensation fails, the rate of the pulse rises suddenly.

Here we would again emphasize the extreme importance of frequent and careful observation of the pulse-rate after abdominal operations. We have known instances in which the diagnosis of post-operative hæmorrhage and its successful treatment has been solely founded upon a rapid and otherwise unexplainable rise in the pulse-rate, and there is nothing in which a house surgeon may take such legitimate pride as the knowledge that his careful observation in such a case has been the means of saving the life of his patient. Anxious uncertainty will often

ACUTE PERITONEAL INFECTION SIMULATING HÆMORRHAGE

There is a rare form of acute peritoneal infection so overwhelming in its intensity as to simulate intraperitoneal hæmorrhage.

The patient is blanched, and the pulse-rate so rapid as to be uncountable, and so small as not to be felt. The abdomen is somewhat distended, but not, as a rule, rigid or even painful. The symptoms develop with great swiftness, and the few cases we have seen have all terminated fatally. An accurate diagnosis is impossible short of re-opening the abdomen, which should always be done.

DEFICIENT BLOOD COAGULABILITY

Since hæmophilia is a condition that does not affect the female, gynæcological surgery has not to take count of it. There are, however, many women who exhibit a certain deficiency in the clotting power of their blood, marked by a continual and troublesome oozing during any operation. In such patients, when the skin sutures come to be taken out at the end of some days, the skin will be found stained yellow by effused blood or even exhibiting ecchymotic patches. The administration of calcium for some time before the operation, in the hope of raising the clotting power of the blood, has not, we have found, made much difference. There are certain hæmorrhagic states, apart from hæmophilia, like chronic jaundice, during which it might on rare occasions be necessary to perform a pelvic operation. Work recently published,* shows that the failure of the blood to coagulate is caused by a deficiency of prothrombin and that a fat-soluble substance, vitamin K, is able to restore normality. There is evidence that prothrombin is formed in the liver if an adequate supply of vitamin K is maintained. The presence of bile-salts in the intestinal canal is necessary for the absorption of this vitamin. A synthetic analogue of vitamin K has been prepared, called lykinone. It is water-soluble, potent, non-toxic and administrable parenterally. Clinical experience with it, however, is not yet available.

TOXIC SHOCK

There is a condition which will be familiar to all who have experience of abdomino-pelvic surgery. The patient is elderly, she is enfeebled, and she is the subject of cardio-vascular degeneration. The operation has been severe, and usually accompanied by considerable loss of blood; shock immediate, and presenting the symptoms described above, has supervened; and the patient under appropriate treatment has rallied. On the morning following the operation she presents a

* *Brit. Med. Jour.*, August 9, 1941; II, 190.

very characteristic picture. The face has a dusky flush; the pulse is strong and throbbing, and its rate is fast; the eyes are glistening; the mental condition is very active, and the patient is often sweating profusely. She expresses herself as feeling "quite well," "never better," and so forth. All these symptoms become accentuated as the day goes on, and there is great restlessness and a total absence of sleep. The face, though still very flushed, has a bluish tinge, and the hands are blue and cold. On the next day the pulse is softer, more running, and its rate is faster, while the apex-beat of the heart will be found to have moved outwards beyond the nipple-line. Mental excitement remains, but the patient has a difficulty in recognizing those about her, and she rambles in her speech. In spite of all stimulant treatment, there is a progressive loss of strength; her skin becomes cold, her pulse imperceptible, and her respirations fast. Death ensues 2 to 4 days after operation.

Post-mortem examination does not disclose any local abdominal cause for death at the site of the operation, but the heart in most such cases is fatty and dilated, and it is to the acute dilatation and failure of this organ that the fatal termination must be ascribed. Cases such as these are almost certainly due to some form of toxic absorption.

A still more acute form of toxic shock is sometimes seen after operations for large pyosalpinges or other similar collections of pus in which, during the manipulations, the abscess-sac ruptures and the contents escape broadcast into the peritoneal cavity. The post-operative shock in such cases may be very severe and quite out of proportion to the trauma and loss of blood.

CHAPTER XXXIII

POST-OPERATIVE COMPLICATIONS (Continued)

PERITONITIS

Causes.—Septic peritonitis is due to infection of the peritoneum conveyed by—

- (1) Some instrument, ligature, suture, swab or towel.
- (2) The hands or breath of the operator, or of his assistants.
- (3) Pus which has escaped when a suppurating ovarian cyst or pyosalpinx, or other collection of pus, is being removed, or by faecal matter escaping through a rent in the bowel or in the course of intestinal resection.
- (4) The skin of the patient.
- (5) The patient's vagina.
- (6) An effusion of blood. It was shown by Sargent and Dudgeon that the presence of blood in the peritoneal cavity is shortly followed by the appearance of organisms therein.
- (7) Auto-infection of damaged tissue, most commonly by bowel organisms.

It is obvious that the more the patient's tissues are bruised by rough handling, the greater the liability to infection. Further, there are certain conditions of tissue-damage which peculiarly favour bacterial activity. It is a remarkable fact that areas of complete vascular stasis (white infarction), whether produced by an embolus or due to an occluding ligature (*see p. 42*), are not associated with inflammatory phenomena, whereas those of partial vascular stasis, and especially of venous stasis, such as is found in the tissue distal to a sub-occluding ligature, the twist of an ovarian pedicle or the constriction at the neck of a hernial sac, rapidly become the seat of an intense bacterial invasion. The absence of any symptoms following the application of a surgical ligature to a piece of omentum, as compared with the violent results when the same tissue becomes strangulated in a hernial sac, may be cited as an example. Tissues so damaged, and lying in close proximity to the bacteria-laden intestine, readily become the seat of auto-infection therefrom.

Septic peritonitis is most commonly due to some flaw in the aseptic technique. The greater the care that is taken with the preparation of the patient, instruments, swabs, ligatures, and the hands and breath of

the surgeons and nurses, the fewer will be the number of cases occurring in the surgeon's practice. Granted a certain amount of operative ability, a surgeon's results will depend not so much on the difficulties of the case, or the rapidity of his manipulations, as on careful and minute attention to secure a perfect asepsis, or an asepsis as nearly perfect as may be. Wherever the greatest precautions are taken to keep the operation and its field aseptic, there will the best results be found.

Further, from a study of the causes of peritonitis, it is evident that the more perfect the hæmostasis the less likelihood will there be of peritoneal infection, other things being equal. Thus, the surgeon who, to attain rapidity, is content to take the chance of capillary oozing occurring after he has closed the wound, may be chagrined to find that his case does not run the same apyrexial course as that of a colleague at whose slow and laborious workmanship he is apt to scoff.

Lastly, from our remarks on the auto-infection of damaged tissue, it will be seen how necessary it is for the surgeon to handle as lightly as possible the parts with which he is dealing, and to remember when applying ligatures that nothing is so likely to become infected as a mass of tissue the vascular circulation through which is gravely interfered with but not entirely occluded (*see p. 42*).

GENERAL PERITONITIS

Symptoms and signs.—The first symptoms of peritonitis appear, as a rule, about the third day. In patients infected before the operation, the symptoms and signs may appear earlier; in fact, the condition of the patient may never have been quite satisfactory since the operation. Lastly, and more rarely, this complication may declare itself only towards the end of the first week.

Pulse.—Instead of the pulse-rate falling, as it should do, within 24 hours of the operation, it gradually increases in frequency to 120 and over. It is at first small and hard, but as the fatal termination draws nigh, its strength decreases, and at the last it cannot be felt.

Temperature.—This, as a rule, is above normal from the first, and continues to rise until it reaches 104° F., or even higher. A rapidly rising temperature on the second day is a symptom of serious import. The temperature, however, is not so good a guide as some of the other signs, for even in very acute cases the rise may not be marked, and in some of the worst cases, especially when of a suppurating character, the temperature may be subnormal (*see p. 840*).

Vomiting.—*See p. 824.*

Distension.—*See p. 827.* Exceptionally, distension may be absent, the belly being retracted and hard.

Pain.—Abdominal pain is one of the first symptoms complained of, and may be frightful in its intensity, though rarely, in some of the worst cases, and especially those associated with a purulent effusion, pain is absent. We have noted as a point of very bad prognosis the complaint of pain felt under the ribs and through to the back.

Respiration.—The breathing is purely thoracic and very rapid; and it may here be noted that while a rapid pulse-rate following abdominal section is a bad sign, *its conjunction with rapid respiration is peculiarly ominous.*

Abdominal tenderness and rigidity.—As a rule, abdominal tenderness is very marked, and universal. The patient cannot bear the least pressure on her abdomen, which is held absolutely rigid. In those rarer cases in which the temperature is subnormal, the distension not marked, and the pain but slight, abdominal tenderness may be absent, but rigidity remains.

Defæcation.—The bowels are very inert, very little flatus or fæces passing, and aperients or enemata have no effect.

Micturition.—Pain on micturition is usually present, and is due to the movement of the inflamed peritoneum covering the bladder as this organ contracts. The dread of this pain is such that, at times, retention results.

General signs.—The patient is restless, she has an anxious expression, her face becomes drawn and her complexion grey. Her features are pinched and shrunken, her tongue is dry and brown, her body is bathed in a cold perspiration, her extremities are cold. Mental activity may be maintained almost to the last, but occasionally delirium and coma end the scene. The duration of the symptoms from start to finish is rarely over 3 days.

Diagnosis and treatment.—The diagnosis of general peritonitis, or rather, let us say, the diagnosis of the *cause* that underlies the peritonitic symptoms, is not always easy.

The symptoms of general peritonitis are due to two factors: (1) toxic absorption from the inflamed peritoneum, and (2) intestinal obstruction and toxic intestinal absorption. Sometimes the symptoms due to the first of these factors predominate, and sometimes those due to the second.

In cases of the first group the patient presents the symptoms of acute septic absorption, and the intestinal signs and symptoms are relatively insignificant. In the worst examples collapse, so rapid as closely to simulate intraperitoneal hæmorrhage, may occur (*see p. 840*), and there is scarcely any distension or vomiting.

In cases of the second group, intestinal symptoms are the leading feature. The abdomen is distended and the vomiting persistent and obstructive.

Obstruction, either parietic or organic, is, in fact, present, either the cause, the accompaniment, or the result of the peritonitis, and symptoms due to septic peritoneal absorption are augmented, and in many cases masked and overwhelmed, by those due to toxic intestinal absorption.

Not only may acute peritoneal sepsis simulate intraperitoneal hemorrhage, but intraperitoneal hæmorrhage itself provokes peritonitis. Usually, peritonitis may not only be the cause of intestinal obstruction, but also by secondary paralysis or by adhesion between neighbouring loops of intestine, but also an intestinal obstruction of the organic variety may itself be the starting-point of a general peritonitis.

The diagnosis of the exact condition is so difficult that, with the most careful consideration of the features of the case, the surgeon is more often than not unable to be certain of the course of events which has brought his patient into so parlous a state.

His proper course in these difficult circumstances will be, in most cases, to re-open the wound and so make clear the condition and its appropriate treatment.

Multiple drainage and posture.—It may be that on opening the abdomen the surgeon will find a clear and removable cause for the peritonitis, such as a collection of pus in an ovary conserved at the operation, an infected mass of blood-clot, an intestinal torsion, or an aperture in the bowel. Such conditions will be dealt with appropriately, but whether they be or be not found, the peritoneum must be drained in several places. Tubes should be inserted into the pelvis through the original wound, and through other incisions into the iliac sæ and loins. On being returned to bed the patient must be maintained in Fowler's position to aid the drainage.

Continuous injection of saline-glucose solution.—Large quantities of saline-glucose solution should be given by continuous intravenous injection. The technique is fully described at p. 805. The *rationale* of the treatment is as follows :

1. The body is short of water because of the incessant vomiting. In the absence of sufficient water the leucocytes are unable to resist the infecting micro-organisms.
2. If the blood is deficient in water the infected peritoneal exudation tends to pass into the blood-current. If an excess of water is introduced to the blood the process is reversed.
3. The saline solution, by diluting the toxins, renders them less harmful.

If vomiting is a feature of the case as it almost always is, continuous gastric suction relieves the patient of the effort.

We have seen marked benefit result from this treatment, which should always be applied in cases of severe peritonitis.

Stimulants.—Apart from the methods of treatment already dealt with, the surgeon can only combat heart-failure by brandy, coramine or camphor, digitalin and strychnine, and by treating vomiting and distension by the methods indicated at pp. 824, 827. Morphia should be given freely and drugs of the sulphonamide group may be tried.

Penicillin and sulphonamides.—These in combination can be applied to a discrete septic focus if any such is discovered on re-opening the abdomen—otherwise they should be administered parenterally, either by the intravenous or intramuscular route.

LOCAL PERITONITIS

Symptoms and signs.—As a rule, for some days the patient appears to be progressing satisfactorily. Then the pulse-rate and temperature commence to rise, but in neither case to any extreme, the pulse-rate being generally under 120 and the temperature fluctuating between 100° F. and 103° F.; the abdomen is slightly distended, and there are pain and tenderness, most often of a localized character. In other cases the general symptoms may be more marked: the temperature is higher, the pulse-rate quicker, the tongue may become dry and brown, vomiting may be troublesome, pain may be intense and, if together with all these, a local site cannot be distinguished, the case may be mistaken for one of general peritonitis. In local peritonitis, however, a tumour sooner or later appears, consisting of adherent and thickened omentum, bowel, and peritoneal exudate.

Diagnosis.—When any symptom of sepsis appears, the surgeon should carefully examine the patient to ascertain if there is a local cause.

The abdominal wound should be inspected, the iliac regions palpated, and a vaginal examination made. If local peritonitis is present, a hard and very tender swelling may be found in the region of one of the pedicles, or an inflammatory mass can be made out filling up the pelvis and extending towards the abdominal wound.

The symptoms are often those of partial intestinal obstruction with vomiting, fever, and wasting. These cases usually terminate by a copious discharge of pus, often stinking, from the lower end of the abdominal wound, which is followed by instant relief.

Fetor is not an indication of any communication with the bowel unless it is accompanied by gas and faecal matter, but the establishment of a faecal fistula is commonly preceded by these symptoms of local suppurative peritonitis. The possibility of this complication is the strongest argument in favour of draining the operation-site by a small tube in all those cases in which the asepticity of that site cannot, by reason of the previous condition, be ensured. The tube, which may be removed in 3 or 4 days if the patient is doing well, establishes a track along which the pus, if it forms, can readily make its way to the surface.

Results.—As a rule, cases of localized post-operative peritonitis recover in the end, although convalescence may be delayed several weeks. In a few days adhesions are formed round the infected area which prevent any general absorption, while a certain number of cases recover without suppuration. Rarely, a general septic peritonitis starts from the local focus.

Treatment.—If the presence of pus is diagnosed, it must be evacuated. If the swelling presents in the neighbourhood of the wound, this should be re-opened. If there is a marked fluid swelling in Douglas's pouch, an incision should be made into it from the vagina, and after it is evacuated the cavity should be drained with a tube. If an abscess appears in the iliac region, it should there be opened. Any further complications should be treated as they arise. For the pain, hot fomentations may be applied to the abdomen, and morphia should be given, while vaginal injections of some antiseptic solution at a temperature of 110° F. often afford much relief and seem at times to aid absorption. Cardiac weakness should be treated with stimulants and sepsis combated with penicillin or one of the sulphonamides.

The bowels must be regulated with enemata, and the patient fed *per rectum* if the vomiting and distension are marked.

PELVIC CELLULITIS

Inflammation of the cellular tissue of the pelvis, and more especially that of the broad ligament, may follow a dilatation of the cervix when the cervical tissue has been lacerated, a curetting of the uterus, or some operation involving the broad ligament. For instance, infection may spread from a septic stump after the removal of a pyosalpinx, or subtotal hysterectomy. Again, after the enucleation of a broad-ligament tumour, a vessel may ooze, causing a hæmatoma, which later may become infected from the bowel. Pelvic cellulitis gives rise to pain local to the region affected. The temperature is raised and the pulse quickened but not to the same extent as occurs in peritonitis. Though a slight degree of distension may be present, it is local over the affected area and there is an absence of the intestinal symptoms so characteristic of peritonitis. Sooner or later a localized mass will become apparent on vaginal examination, lying in close relation to the uterus and vagina.

Treatment.—The early use of penicillin or one of the sulphonamides may avert the attack. Before suppuration has taken place the patient should be treated by abdominal fomentations, hot vaginal douches and sedatives to ease the pain. If pus forms, as shown by the accentuation of the symptoms and the leucocyte count, it must be evacuated. When the swelling presents towards the vagina it may be incised through that passage, great care being taken not to injure the bladder or a

ureter. When the swelling mounts upwards and can be easily felt from the abdomen, it is better to open it from above.

INTESTINAL OBSTRUCTION

There are two varieties of post-operative intestinal obstruction: (1) that due to some gross lesion occluding, or partially occluding, the lumen of the intestine in some part of its course—"organic blockage"; and (2) that due to an inhibition, parietic or spastic, affecting either the whole length of the intestinal wall or limited to some particular segment—functional obstruction or "parietic ileus." Organic blockage will be first considered.

ORGANIC BLOCKAGE

The blockage may be due—

1. To adhesions of intestine to other parts.
2. To escape of intestine through some orifice.
3. To inclusion of intestine in a ligature.
4. To strangulation by bands.
5. To incarceration of intestine in the pelvis.

1. Adhesions of intestine to other parts.—The intestine may become adherent to the pedicle left after the removal of an ovarian cyst or a diseased Fallopian tube, to the stump or suture-line after a subtotal hysterectomy or myomectomy, to the suture-line after total hysterectomy, to another piece of intestine, to the back of the uterus, to the broad ligament, to the floor of the pelvis rough from adhesions, especially after operations for salpingitis, or to the parietal wound. As a result of the adhesion the bowel becomes kinked and the lumen narrowed.

The mere narrowing of the lumen, which in many cases is the only immediate result of the adhesion, would not in itself be sufficient to give rise to symptoms of obstruction, but it is accentuated and made absolute by flatulent distension of the gut above it. Such distension may be quite independent of the original adhesion, but its effect is acutely to increase the kink at the point of adhesion. Such kinkage, either by sheer torsion of the bowel, or by bringing the adhesion tautly across the bowel, compresses the intestinal wall at this point and produces local tissue-damage.

A virulent activity of the intestinal bacteria which is perhaps the most characteristic feature of intestinal obstruction spreads rapidly upwards, and as a result, the intestine above the stricture becomes filled with a brown-yellow fluid poured out by the intestinal wall and swarming with bacteria in a state of exalted virulence. The distension increases and, as it does so, makes more and more absolute the constriction, until at that point, partly by reason of obstructed blood-supply and partly by reason of the bacterial activity, the intestine may become gangrenous, if the patient lives long enough.

2. Escape of intestine through some orifice.—The intestine may slip through a hole in the mesentery, a hole formed by an adhesion or by another piece of intestine becoming adherent to some other organ, the pelvic wall or abdominal parietes.

Also, in cases in which the abdominal wound has been insecurely fastened, or in which great straining and vomiting has caused one or more stitches in the wound to give, a knuckle of intestine may slip through between the cut edges of the fascia and become nipped.

This accident has happened, too, during the closure of the abdominal wound, a piece of gut projecting between the cut edges of the incision and remaining undetected.

3. Inclusion in a ligature.—If the operator is not careful, a piece of bowel can easily be included in a pedicle-ligature. If a tumour of the left side has distended the mesosigmoid, care must especially be taken to avoid including a piece of the colon in the ligature that secures the ovarian vessels for, owing to the very close proximity of the sigmoid to the left broad ligament, this danger is a very definite one. It may, however, be avoided by deliberately incising the peritoneal frænum that unites the colon to the ligament, before applying the ligature.

4. Strangulation by bands.—As a result of inflammatory processes in the abdomen or pelvis, bands may form and become attached to different structures, and the intestine, slipping beneath them, may become strangulated. In other cases the omentum becomes adherent in the pelvis and exercises injurious traction on the transverse colon. When the ovario-pelvic ligament is thickened and shortened as the result of chronic inflammation, ligatures applied to it may so further shorten this structure as to pull upon the sigmoid mesocolon at the brim of the pelvis and kink the bowel. Lastly, appendices epiploicæ are peculiarly liable to adhesions, thus anchoring a loop of the colon in the pelvis by a narrow pedicle around which the bowel may rotate and strangulate.

5. Incarceration in the pelvis.—In burying the ovarian stumps after hysterectomy, by any method which approximates them to the conserved stump of the cervix, such traction may be made on them as seriously to narrow the entrance to Douglas's pouch, and we have seen two cases in which a coil of bowel became consequently incarcerated therein.

FUNCTIONAL OBSTRUCTION ("PARETIC ILEUS")*

In functional obstruction ("parietic ileus") there is no gross material cause of blockage, and the arrest of the intestinal flow is brought about by a disturbance in the neuro-muscular mechanism of the bowel-wall. All hollow muscular organs are self-adjustable to the size of their

* Victor Bonney. "The functional derangement of the intestine which follows abdominal operations." *Bradshaw Lecture, R.C.S., Lancet, Dec. 15, 1934.*

contents, relaxing or retracting in virtue of muscle-tone as the bulk becomes bigger or smaller. In an organ like the bladder, relaxation and retraction alternately affect the whole, but in the intestine the process operates in sections so that while one is relaxed another is retracted. Thus, the intestine is not to be regarded as a continuous tubular cavity, like the inner tube of a tyre, but as a series of gas- (and sometimes fluid-) containing compartments, each of which is bounded by a zone where the muscular wall has by retraction closed the lumen. This is the reason why an opening made into the intestine does not deflate the whole of it but merely empties a few adjacent coils.

This automatic mechanism depending on muscle-tone must not be confused with the contraction of peristalsis, which is additional to it, as indeed in all muscle, striped or unstriped, contraction is additional to tone. When peristaltic contraction occurs, the zone of retraction next below it should automatically relax to allow the contents to pass on and, if such relaxation does not take place and the peristaltic contraction is not strong enough to force it to do so, the passage of the contents is arrested, as it also is if no contraction occurs at all.

There are therefore two possible happenings in functional obstruction: persistent retraction, and absent or inefficient contraction and, though both probably play a part, one or other of them appears to be dominant in different cases. Thus in some instances the patient suffers from colicky spasms very suggestive of organic blockage, though in fact there is none, while in others there is a total absence of any evidence of intestinal movement.

In the first type of case, on re-opening the abdomen the conditions found are as a rule as follows: a segment of intestine, usually the lower ileum, flattened and shrunken; above it a segment much distended with gas but with little fluid in it; and above that again a segment, usually the upper jejunum, greatly distended with gas and both distended and heavy with fluid. The flattened segment is certainly in a state of spastic retraction, for it is difficult to force gas into it from the distended segment above, which would not be the case if it were merely in flaccid collapse.

In the second type, the whole small intestine and perhaps part of the large intestine is distended, in the lower part principally with gas but in the upper part with much fluid as well. Occasionally cases occur in which the distension is limited to the jejunum, the bowel below it appearing normal—a remarkable finding, seeing that the operation area in the pelvis is so remote from that of the bowel affected.

In both types the distended gut is markedly hyperæmic and of a bluish tinge, indicating partial venous stasis, and the mesenteric veins are turgid. Blocked capillary vessels are seen as dark lines running circumferentially in the bowel-wall. The fluid in the upper intestine, which is identical with that vomited, is more or less fæcalized, and it

is the presence of this corrupt and bacteria-laden liquid that is immediately threatening the patient's life.

How the disturbance of the muscular mechanism of the howel-wall is brought about is not yet solved, but certain facts about the condition are known. It is clear that no hard-and-fast line can be drawn between functional obstruction and that disturbance of intestinal action which produces post-operative flatulence and distension after almost every abdominal section. The two appear to be varying degrees of the same thing (*see p. 825*).

It is also observable that functional obstruction bears no constant relation to sepsis, either before or after the operation. It is frequently stated to be due to peritonitis, and it certainly may co-exist with it, but in a great many cases there are no signs of peritonitis at all, and some writers have apparently mistaken the vaso-motor changes described for inflammatory reaction. That they are not inflammatory is shown by the very rapid disappearance of all symptoms when a successful jejunostomy has relieved the patient from the load of *feculent fluid* that was poisoning her.

On the other hand, the magnitude of the operative procedure is of importance, functional obstruction being specially apt to follow a severe operation involving much disturbance of the intestines. The age of the patient also has an influence, functional obstruction being much commoner in the middle-aged than in the young. There is also considerable evidence to show that it is favoured by conditions like torsions, strangulations and suboccluding ligatures, which leave within the abdominal cavity an area of tissue from which the venous return is wholly obstructed while its arterial supply is only partly obstructed (*see p. 42*).

Finally and, from the point of view of causation, most importantly, there is the fact that functional obstruction may follow certain events outside the abdominal cavity. Thus, it is a well-known post-operative complication of prostatectomy and nephrectomy, and it sometimes follows posterior retroperitoneal hæmorrhage and severe injuries and operations in the neighbourhood of the hip joint. As a terminal event, it is sometimes met in lobar pneumonia and, further, it occasionally occurs spontaneously in the course of pregnancy. I have seen two such cases and others have been recorded, and I know of one case where the symptoms and physical signs came on suddenly with no obvious antecedent cause in an elderly woman not pregnant, and in perfect health. The condition was verified by operation.

The chief deduction from these facts seems to be that, whatever may be the nature of the agent that disorganizes the contractility and tone of the intestinal muscle and the vaso-motor mechanism of the intestine, it is not necessarily produced in the intestine, nor even in the abdominal cavity, and that in the extraperitoneal events we have

cited it is certainly produced outside it. That being so, it must be transported from the site of production to the intestinal muscle and nerve-muscle mechanism, but the route is hidden from us, though the perineural lymphatics may be suggested. It is known from Dale's researches that acetylcholine is the link between nerve impulse and muscle contraction, but muscle-tone appears to be independent of nerve control. The conception that the state of the intestine in intestinal obstruction, whether organic or functional, is immediately due to an agent which may be generated either at the seat of obstruction, or in its neighbourhood, or remote from it in the peritoneal cavity, or even outside it altogether, offers an explanation why it is that with the same degree of mechanical blockage the symptoms differ so in different cases.

Consider for a moment the effect of a colostomy performed as described on p. 759, in which, after the bowel has been severed, the upper end, tightly closed, is brought out on the abdominal wall and left there unopened for 4, 5 or 6 days. There is absolute blockage but no symptoms of obstruction. We once saw a case in which a surgeon inadvertently tied a ligature tightly round a piece of small intestine and closed the wound, not knowing he had done so. There was a total absence of symptoms for nearly a week afterwards! Such delay in the appearance of the symptoms of obstruction presents a strong contrast to the immediate and violent onset which characterizes an acute sigmoid volvulus. But the discrepancy is accounted for if, in the tissue at the twist of the volvulus, an agent is rapidly produced which by disorganizing the nerve-muscle and vaso-motor mechanisms adds functional obstruction to organic blockage already present. Likewise, the acute obstructive symptoms produced by a strangulated Meckel's diverticulum or a partial (Richter's) hernia, in neither of which is the direct passage-way of the intestinal flow mechanically blocked, are also accounted for if, in the tissues thus strangulated, the same agent is produced.

My view that the basic cause of parietic ileus is an agent or factor generated, as a rule, at a distance from the area of the neurovascular changes present in the bowel, has been strengthened quite recently by the publication of two cases (both fatal) in which the condition was the result of the administration of Hexamethonium, given to reduce blood pressure.*

We have already shown (p. 827) how functional (parietic) distension can bring about organic obstruction, and what we have written above shows how functional obstruction is always sooner or later added to organic blockage. The two conditions are in fact so closely associated that hard-and-fast separation is both confusing and misleading.

Symptoms of intestinal obstruction.—It is very desirable for the

* Herson and Kelsall *Lancet*, 1951, 1, 585, and Mackey and Shaw, *Brit. Med. J.*, May 26, 1951.

surgeon to decide whether the symptoms he is called upon to treat are caused by organic blockage or by a spastic or paralytic state of the bowel-wall for, if it be organic blockage, the sooner he re-opens the wound and relieves the blockage the better will the patient's chances be. Whereas, if the obstruction be functional, a further operation, unless it be to open the distended intestine, is not only useless but harmful. Unfortunately, there are many cases in which the distinction is very difficult, or impossible, short of re-opening the abdomen. We shall therefore consider the symptoms of obstruction under the following heads, contrasting under each the differences between organic blockage and functional obstruction.

(1) *Onset of the symptoms.*—The symptoms of organic blockage may appear at any period after operation, whereas functional obstruction almost invariably occurs within the first week. In the interval between the operation and the onset of symptoms of organic obstruction the patient may appear to be doing well, whereas with functional blockage the abdomen has never been satisfactory since 24 hours after the operation.

(2) *Pain.*—That of organic blockage is typically an intermittent colic of great intensity, excited by food or by abdominal palpation. Loud gurglings are heard, and often visible peristalsis may be observed, a coil of bowel elevating itself into a swelling which may be felt and seen while the spasm lasts. The patient can often correctly describe the route the peristalsis takes and the point at which it stops. In functional obstruction, on the other hand, the pain, though colicky, is much less severe or there may be no pain at all, coupled with a total absence of any signs of intestinal movement. Patients with organic blockage do not, however, always have great pain, and it may be remittent for long intervals or may occur merely at the onset and not afterwards. In such patients functional obstruction with complete paralysis of the intestine has supervened early and masked the organic lesion. A distressing feeling of distension is constant with functional obstruction but takes longer to develop in organic blockage.

(3) *Abdomen.*—The distension of organic blockage is always local to begin with and, even when general, is more marked at one spot; thus with blockage in the sigmoid the most striking tumidity is in the left iliac region and over the cæcum, while in that due to adhesion of the intestine to the abdominal wound a very characteristic swelling can be felt under the wound. In functional obstruction the small intestine is usually alone affected; the most distended part is the jejunum, and the abdominal contour corresponds with this. In both the abdomen is rigid but not markedly tender, except that in organic blockage there may be local tenderness over the site of the block. When the obstruction is profound the distension is so great that the skin becomes shiny. Occasionally cases of organic blockage are met in which there is no

distension until very late. They are most deceiving and the surgeon should be on his guard against missing them.

(4) *Fever*.—There may be some degree of fever with both organic blockage and functional obstruction.

(5) *Flatus and the results of enemata*.—In the early stages of organic blockage and also in functional obstruction some flatus may pass through the rectal tube but the amount becomes progressively less in spite of the increasing distension. During the course of an enema or rectal wash-out a certain amount of air may enter the rectum which, being expelled later, is mistaken for intestinal gas. When the site of organic blockage is very low down it may be impossible to introduce large enemata or wash-outs. In functional obstruction if the lower bowel is paretic, enemata are apt to be retained.

(6) *Vomiting*.—The great characteristic of obstructive vomiting, whether due to organic blockage or to functional obstruction, is that it is in quantity so much greater than the amount of fluid put into the stomach. Moreover, it occurs though nothing at all has been swallowed, and is spontaneous and not preceded by nausea. A very characteristic feature is that the patient, after retaining all the nourishment which has been given for several hours, suddenly and without warning ejects a large quantity of fluid, containing undigested all the food she has taken. The vomiting comes on gradually at first but later is frequent. It is simply bile stained to begin with, then becomes brown with a sour smell (intestinal vomit) and finally definitely faecal.

(7) *Facies*.—In organic blockage the aspect of the patient is one of acute distress during the spasms of pain, succeeded by a comparative calm in their interval. In functional obstruction the face is distressed in proportion to the amount of distension, but does not bear that look of apprehension which is seen when organic blockage is present.

Distinction of peritonitis from obstruction.—The pain of peritonitis is continuous, and the abdomen so very tender that the patient makes no attempt to move but lies rigidly, generally with her legs drawn up. The abdomen is distended but not to that extent seen with obstruction, and intestinal movements can neither be seen, felt or heard. The temperature is nearly always considerably raised, the patient looks toxic, and the tongue is dry and raw-looking. Flatus may pass quite well in peritonitis unless it is accompanied, as it sometimes is, by organic or functional obstruction. The vomit is much less copious than in obstruction and generally only follows the introduction of food into the stomach. It does not become faecal and only rarely intestinal. The facial aspect is one of continued agony and apprehension.

The prophylactic treatment of obstruction.—It is impossible to avoid the risk of either organic blockage or functional obstruction after pelvic operations, but it may be diminished by attention to the following points. The determining cause of post-operative organic obstruction

is usually flatulent distension above the point of adhesion or kinkage, and no hard-and-fast line can be drawn between the ordinary post-operative flatulent distension and the functional obstruction caused by "parietic ileus" for they appear to be different degrees of the same thing. It is clear, therefore, that the more neat, gentle and clean the technique of the surgeon, the less will his patients suffer from post-operative flatulence and the safer they will be from post-operative obstruction whether caused by mechanical blockage or functional disturbance of the intestinal muscle. In particular, he should see, before he closes the peritoneal cavity, that the intestines and omentum are occupying their normal position. This is peculiarly important in abdomino-pelvic surgery, because the Trendelenburg position displaces all of them upwards and the omentum often becomes rolled up under the lower border of the stomach. A surgeon who carelessly leaves it so is asking for trouble.

Care should be taken not to handle the intestines more than is necessary and particularly to avoid prolonged traction on the mesenteries, for the condition of "parietic ileus" may in certain cases be due to injury to the splanchnic nerves contained therein. Eventration of the intestines for a long period is especially to be avoided. Excessive packing with swabs or gauze to restrain the intestines is also undesirable, for forcing them into the upper abdomen is apt to injure the mesenteries by over-stretching.

The liability of stumps of pedicles to adhesion is obviated by burying them and, if this cannot be done, the surgeon should be sure that the ligatures on them are occluding, bearing in mind the dangers of sub-occluding ligatures as set forth on p. 42. Intestine and omentum are peculiarly likely to adhere to surfaces covered with a film of blood-clot, and it is important to ensure as perfect a hæmostasis as possible. This advice particularly applies to myomectomy and hysterotomy.

Inflamed omentum is a frequent cause of adhesions. It is a matter of common observation that, when an abdomen has to be re-opened months, or perhaps years, after an abdominal operation for pelvic disease, the omentum will quite commonly be found adherent to some portion of the pelvis or pelvic organs, whereas the bowel is only rarely so. If the omentum is inflamed or its lower part ragged and rough, we always remove the affected portion and at such level that the new edge is well above the brim of the pelvis.

Great care must be taken in suturing the peritoneal layer of the abdominal wound, for if gaps are left in it, or the sutures prematurely give way, the intestine rapidly contracts a firm adhesion to the under surface of the fascia, or actually forces its way as an interstitial hernia between the layers of the abdominal wall. For this reason the catgut used to suture the abdominal wall should be fortified, not plain.

Curative treatment of organic blockage.—If the existence of a

slight partial organic block be merely surmised and the patient be not materially ill, expectant treatment may be adopted in the hope that the bowel may right itself. Such treatment consists in withholding food or fluid by the mouth so as to minimize peristalsis, and in combining continuous intravenous saline-glucose infusion and continuous gastric suction with the frequent use of rectal wash-outs and enemata. Aperients of any sort should never be given to a patient who has any sign suggestive of an organic block. It is most important that, in his endeavours to avoid a second operation, the surgeon should not miss the favourable opportunity for relieving the block.

On the definite diagnosis of an organic block, several courses are open to the surgeon. The ideal treatment, namely to re-open the abdomen and remove the cause, should always be adopted when the patient is in a state to bear the operation. In this connexion it is to be remembered that the operation may be both difficult and lengthy, from the distension, the diffuse adhesions which may be present, and the difficulty of identifying the position of the block. The extroversion of the distended intestines which results from the large incision often necessary, besides considerably increasing the shock, adds yet another difficulty to the operation, namely, that of returning the bowel and closing the wound; in fact, this is sometimes impossible until the gas in the bowel has been let out by puncture, a procedure which involves a very definite risk of septic infection of the operation-area. With advanced acute obstructive symptoms, unless the intestine can be enabled at the same time to empty itself of the gas and noxious matter that it contains, the mere removal of the block is insufficient. The chief impediment to this is the multiple kinks produced by the great distension, together with more or less inertia of the intestinal wall. The block having been found and relieved, the surgeon must consider whether the distended small intestine above it is likely to empty itself or not, and if he has any doubts as to its doing so, he should either immediately make arrangements for continuous intestinal suction, if it is not already being employed (*see* p. 857), or else perform jejunostomy.

We think that when the block, though acute, is diagnosed early, or when it is subacute or chronic in character and the patient's condition good, and when its location can be gauged with fair accuracy, an attempt should be made to deal with it, particularly if it is in the small intestine.

But if the patient is very ill, the distension very great, the seat of the block unknown, or its nature surmised to be such that it cannot be readily rectified, it is best to perform jejunostomy (*see* p. 737), or cæcostomy (*see* p. 736), and to await a more favourable time for dealing with the origin of the trouble. The necessity for either of these operations will often be abrogated altogether if continuous intestinal suction is employed.

Jejunostomy is indicated when the site of the block is entirely un-

known, and also in all cases in which fæcal or markedly intestinal vomiting is present.

Cæcostomy is generally the operation of choice in those cases in which, with known blockage in the large intestine, the distension principally affects the colon and cæcum and the vomiting is not fæcal nor intestinal and copious. In such cases drainage of the small intestine is not imperative, the operative objective being to relieve the distended colon. *Cæcostomy* effects this admirably, and has the advantage that the aperture often closes spontaneously after the blockage is relieved or, if it fails to do so, it can be readily closed by a safe and simple operation.

There remain those grave cases in which, in spite of the fact that the surgeon has relieved the blockage, distension of the bowel remains as before and the vomiting, intestinal or fæcal, continues. In such patients the functional obstruction which supervened on the organic blockage has remained although the blockage has been cleared away. The treatment is therefore that proper for functional obstruction.

Curative treatment of functional obstruction.—The routine use of acetylcholine and prostigmine in all cases of obstinate distension, not deemed due to organic blockage, has been a great advance on all previous methods of dealing with incipient "parietic ileus," but when these drugs fail and the vomiting has become intestinal and increasingly copious, Wangensteen's method of continuous gastro-intestinal suction should be employed.

Continuous gastro-intestinal suction.—Any thin stomach tube may be used, but the best is the Miller-Abbott tube with a double lumen. The larger is used for suction while, by means of the smaller, a thin-walled rubber balloon can be distended which excites a duodenal peristalsis which carries the tube lower and lower down the intestine. When the third mark on the tube (75 cm.) reaches the nose, the balloon is *in the duodenum*, and should be inflated if intestinal suction is required.

The tube is lubricated with liquid paraffin and passed through the nose to the back of the pharynx and, as the patient swallows or takes sips of water, the tube is passed into the stomach. This procedure seldom causes more than minor discomfort but it is often a good plan to anæsthetize the back of the throat by giving the patient, 20 minutes before starting, a pastille of "Decicaine," 1 grain, to suck. The stomach is now washed out by fitting a large syringe to the outer end of the tube, and some water is run down the tube from the syringe, thus freeing it from mucus and débris. This fluid is left in the stomach and the tube clamped with a screw clip and pushed further in so that the end of the tube may enter the duodenum.

A glass bottle with an airtight stopper perforated by one long glass

tube reaching to near the bottom and one short tube just perforating the stopper is three-quarters filled with water. Pieces of rubber tubing are now attached to each of the pieces of glass tubing. That from the short glass tube should be about 4 feet long and that from the long glass tube about 2 feet long. The rubber tubing from the short glass tube is closed off with a screw clip and that from the long glass tube

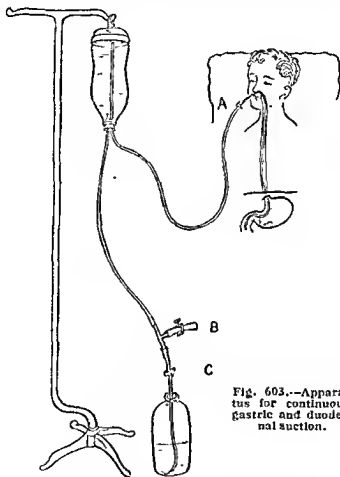


Fig. 603.—Apparatus for continuous gastric and duodenal suction.

is attached to the free end of the stomach tube by a glass connection. The stomach tube is strapped securely to the patient's face with at least two pieces of adhesive strapping (Fig. 603).

The bottle is inverted and suspended from a hook on a stand about 2 feet above the patient's head, and the long piece of rubber tubing is placed with its end in a Winchester bottle or other receptacle on the floor by the bed, and the attached screwclip unloosened, as is also the clip on the stomach tube. As the water starts to run out of the bottle, the gastric contents will be seen to rise up the long glass tubing into the inverted bottle and will finally run into the receiver by the bed.

The patient during the period of suction is allowed fluids by the mouth. This has a good psychological effect and serves as an additional gastric lavage, for the swallowed fluid is immediately sucked up into the bottle. Further, the mouth is kept moist and clean. Since the continuous suction is being carried out on an already dehydrated patient, an adequate parenteral fluid intake is an absolute essential, for otherwise the additional fluid loss and the continual loss of chlorides from the stomach will so upset the acid-base balance and general metabolism that the patient will be killed. The most satisfactory method of preventing this is to have a continuous intravenous drip of one part of normal saline to four parts of a 5 per cent. glucose solution running at the rate of 60 drops a minute throughout the time that the suction is in use. In addition, the patient should be on a fluid intake and output chart. Hypertonic saline (5 per cent.) has been advised to encourage the absorption of fluid stagnated in the distended coils of intestine, but not more than 300 c.c. should be infused. We have no personal experience of it.

Difficulties. Special points.—Sometimes, owing to ill-fitting connections or stopper, an incomplete suction system is created and bubbles of air will be seen running into the inverted bottle. To overcome this the faulty parts may be smeared over with vaseline to stop the leak.

The apparatus may become blocked with mucus or stomach contents, and then the stomach tube is best disconnected and a screw clip placed on the tube leading from the patient to the bottle. Aspiration is attempted with the syringe from the stomach tube and, if this is blocked, more warm water is run forcibly down it into the stomach to free it of clogging material. The apparatus is then re-assembled.

As the negative pressure in the tubing depends on the difference in levels between the patient's stomach and the receiver on the floor, this should be an adequate height, i.e. about 2 feet 6 inches.

The period of suction will depend on the improvement in the patient's condition but, generally speaking, it will need maintaining for not less than 12 hours and may be continued for a week or more if necessary. Improvement will be assessed by the changing appearance of the fluid withdrawn which presently should return to normal, by the lessened evidence of dehydration, and by a slowing of the pulse-rate and an increased fluid output. When the condition has improved, the suction is stopped by a screw clip for increasing periods of time, with the nasal tube left *in situ* and, if vomiting does not recur despite oral fluids, it may then be discontinued altogether, but the intravenous saline is continued for a few days longer.

Continuous gastro-intestinal suction is a great advance in the treatment of functional intestinal obstruction (parietic ileus) and replaces in large measure the operation of jejunostomy which had for its object the evacuation of the jejunal contents, which can now be effected by

continuous suction. It is also applicable to those cases of organic blockage in which the vomiting and distension continue in spite of the block having been operatively removed. The operation of jejunostomy is thus seen to have a lesser place in the treatment of functional intestinal obstruction than it had, but it is available for those cases in which the apparatus necessary for suction is not at hand and also for those in which suction fails:

Finally, those cases have to be considered in which it is impossible to decide whether the obstructive symptoms are due to organic blockage or to functional arrest of the intestinal flow. A trial can be made of continuous intestinal suction combined with continuous intravenous glucose saline infusion which, though it cannot alter the physical element of an organic blockage, may yet deprive it of its harmfulness by doing away with the flatulent distension which immediately determines the occlusion of the passage-way (see p. 827). Though it may fail in this, the patient's condition may be ameliorated and the administration of an anæsthetic made much safer because the stomach is empty.

If suction does not rapidly improve the abdominal condition the abdomen must be re-opened. If an organic blockage is found, this must be relieved. If, on the other hand, the condition is found to be functional obstruction and a retracted flattened segment of the bowel is present, it is generally possible to force gas into it from the gas-distended segment above and, if the flattened segment be the pelvic colon, a rectal tube may be passed into it, guided by the hand in the abdominal cavity. After either of these measures continuous suction should be resumed. With great distension of the small intestine immediate jejunostomy may be indicated, or that alternative to jejunostomy first carried out by Sampson Handley, namely, ileocolostomy and cæcostomy in those cases in which there are two retracted segments, one in the lower ileum and one in the lower colon (ileus duplex). It has the advantage over jejunostomy that a further operation to close the fistula will probably not be necessary, but, on the other hand, it is a longer and more severe procedure. The scope of both these operations has, however, been greatly restricted by the introduction of intestinal suction.

If it is decided to re-open the abdomen in a case of intestinal obstruction, whether organic or functional, spinal anæsthesia should be used if the patient is in a state to bear it, for it promotes retraction of the intestine and facilitates the surgeon's task. On occasions its effect is so powerful that the paresis of the intestine is overcome and flatus passes spontaneously on the table; and, further, the spinal anæsthesia relaxes the abdominal wall much more than any other anæsthetic.

CHAPTER XXXIV

POST-OPERATIVE COMPLICATIONS (Continued)

CIRCULATORY FAILURE

CIRCULATORY failure may follow prolonged operations involving much shock or hæmorrhage, especially if infection is present. The main feature of this type of failure is a progressive fall of blood-pressure, which is due, not to a primary failure of the heart, but to peripheral causes. The blood becomes pooled in the capillaries, the venous return to the heart diminishes and the output and blood-pressure fall, so that the circulation is brought almost to a standstill, and a general tissue anoxæmia arises. Many of the most important operations have to be performed on elderly and enfeebled patients, and it is in such that the special risk of circulatory failure is encountered.

Symptoms and signs.—The signs of circulatory failure are a rapid pulse-rate of small volume, which may become imperceptible at the wrist, pallor or slight cyanosis, a cold, moist skin, and a general state of profound collapse. Respiration is rapid and shallow, or may be somewhat irregular and sighing. The heart-sounds are distant, the apex-beat is scarcely perceptible, the blood-pressure falls below 100 mm. systolic, and is often too low to be measured.

Treatment.—This should aim at raising the blood-pressure by increasing the volume of circulating blood, and so restoring the venous return and output of the heart. Intravenous infusion of warm saline or glucose or, when there has been much hæmorrhage, a blood transfusion, are most effective in this respect. Hypertonic glucose tends to increase the blood-volume by attracting fluid from the tissues, and 50-100 c.c. of a 50 per cent. solution may be given slowly by the intravenous route. Adrenaline tends to raise blood-pressure by vasoconstriction and is, in addition, a direct cardiac stimulant. It may be injected subcutaneously in doses of $\frac{1}{2}$ c.c., or added to the fluid given intravenously. Ephedrine hydrochloride has a similar but more gradual and prolonged action, and may be injected in doses of $\frac{1}{2}$ grain. Strychnine is thought to be beneficial, but must be given in adequate doses of $\frac{1}{20}$ - $\frac{1}{10}$ grain. Cardiazol and coramine are good cardiac stimulants but their effect is transient. These drugs are put up in ampoules for subcutaneous injection, which may be repeated hourly for a few

doses. Cardiazol combined with ephedrine (Cardiazol-ephedrine) is also used to raise blood-pressure. Digitalis is not of any value in post-operative circulatory failure.

Sudden arrest of the heart occasionally happens during anæsthesia, especially light chloroform anæsthesia. In such cases, adrenaline $\frac{1}{2}$ -1 c.c. should be injected directly into the right ventricle, through the fourth left intercostal space, and artificial respiration commenced at once. Patients with organic heart disease generally tolerate surgical operations quite well, provided they are free from congestive heart failure. Pre-operative digitalin will be required in patients suffering from auricular fibrillation. Paroxysmal tachycardia and cardiac asthma may be provoked by operations on patients liable to them by reason of pre-existing heart disease, and these, together with pulmonary embolism, will require the appropriate treatment.

HYPERTYREXIA

Temperatures above 104° F. after abdominal section are of the very gravest import, especially if the rise be continuous. It usually indicates peritonitis or some profound toxæmia, and the patient is almost certain to die.

Treatment.—The primary cause must be treated, if possible, and for the fever tepid sponging, or an ice-cradle, may be tried.

SEPTICÆMIA AND PYÆMIA

These very serious and usually fatal complications may occur after any operation.

Symptoms and signs.—The patient will present the symptoms of fever, usually with rigors; the temperature will be high and remittent, the pulse-rate rapid, and the respirations quick. The skin may be jaundiced or covered with a scarlatinal eruption, and the bowels, which at first are constipated, will become loose. The spleen may become enlarged, and secondary inflammatory foci, such as septic pneumonia, pleurisy, pericarditis, or arthritis, may appear. The face is haggard but flushed, and the mind till the very end is exceptionally clear. There is usually a complete want of perception of the imminence of death. In pyæmia, with the above signs and symptoms, local abscesses form, most often in the pleura, lungs, joints, or liver.

Treatment.—The strength of the patient must be supported by every means as long as possible, and every attempt made to increase her natural resistance. The introduction of penicillin and the various drugs of the sulphonamide group, specially sulphathiazole, has made a great advance in the treatment of streptococcal and staphylococcal

infections and they should be employed. All secondary abscesses should be opened when possible. If the abdominal wound is suppurating it must be freely opened up, irrigated and drained. A successful termination is often as much due to the care of the nurse as to that of the surgeon. In such cases it is absolutely necessary to have a highly intelligent and fully trained nurse, or nurses, in attendance.

TETANUS

Post-operative tetanus is a rare but terrible disaster. In most of the recorded cases catgut has been the ligature material employed, but not by any means in all, for it has occurred after the use of silk and thread and in certain cases when ligature material was not used, as, for instance, after simple dilatation of the cervix. Investigation has shown that imperfectly sterilized dressings (particularly wool) may contain living spores of *B. tetanus*. In those instances in which catgut had been used, subsequent culture of the suspected ligature material has sometimes disclosed the presence of *B. tetanus*, and sometimes has not. Bulloch showed that if steps be taken to remove entirely all traces of fixatives and antiseptics, a large proportion of samples of various surgical catguts are found to contain sporing organisms derived from the intestine of the sheep from which it was made. On the other hand, it appears that *B. tetanus* is very rare in the sheep's intestine. It has been suggested that tetanus following the use of catgut is not real tetanus but a separate infection allied to the disease of sheep called "louping ill," but this is not substantiated. It has been abundantly proved that human faeces sometimes contain *B. tetanus*, but, on the other hand, post-operative tetanus is not specially associated with operations on the intestine but rather the reverse, though it occurs with greater frequency after abdominal, and specially after gynaecological, operations than any others. The few cases of post-operative tetanus we have seen (excluding war surgery) followed operations in which a large amount of catgut had been buried.

Symptoms.—The first symptom, which may occur as early as the fourth day from the operation, is stiffness of the jaw muscles, and the gravity of this portent is apt at first to be overlooked both by the attendants and by the patient herself, who may scarcely complain of it. After it has lasted perhaps 48 hours or even longer, the generalized symptoms of tetanus declare themselves and the disaster is apparent.

Treatment.—Forty-eight hours or more have usually been allowed to slip by before the condition is recognized and treatment begun. Such delay must be guarded against, for the earlier the treatment the better the chances of the patient. Intrathecal injection of anti-tetanic serum must be carried out at once, either by cistern puncture, lumbar puncture, or both, 20 c.c. of cerebro-spinal fluid being first withdrawn

and then an equal quantity of serum injected. The serum should be concentrated, with the equivalent of 60,000 International units. At the same time an equal quantity should be given intramuscularly, by which route the absorption is slower but more continuous. The dosages given may be repeated on the second and third days, according to the patient's progress. Instead of intramuscular injection, the intravenous route may be chosen, but it involves the risk of violent anaphylactic symptoms. Chloral and the bromides in full doses are required, and if necessary, morphia.

The patient, if not already in a single ward, must be removed to one which is darkened, and no one except those in attendance should be admitted to it. Every endeavour must be made to "keep the patient going," since if she survives for 4 days after the symptoms are fully developed the prognosis is much more favourable.

Latent tetanus infection.—A striking example of the length of time the infection may remain latent is afforded by a patient who had tetanus after an extensive myomectomy. Ten years later she appeared with new fibroids requiring further operation. In view of the possibility that the organism was still present in her tissues, she was, after desensitization, given a prophylactic dose of anti-tetanic serum. Sub-total hysterectomy was then performed, through the old scar, and she made an uninterrupted recovery. The scar was excised and from it *B. tetanus* was isolated in pure groupable culture. It was not present in the removed uterus.*

PYLEPHLEBITIS

Pylephlebitis is a rare cause of death after operations on the pelvic organs. When it occurs, it is due to embolic extension from septic thrombosis in one or other of the veins of the portal area. Thus, in some cases of acute salpingitis, or of suppurating or gangrenous tumours, portions of the bowel, mesentery, or omentum may become involved in the process, and the infection, extending to the veins of those parts, may be the starting-point of the disaster.

Symptoms.—At first nothing beyond an undue rapidity of the pulse may be noted, not explainable by the condition of the operation-area. After a variable period jaundice appears, vomiting becomes persistent, the ejecta containing blood in variable quantity, and the patient rapidly sinks, coma supervening before death.

The temperature is not necessarily raised.

Treatment.—Continuous saline infusion into a vein may be tried, and penicillin or one of the drugs of the sulphonamide group may be adminis-

* Victor Bonney, C. Box and J. McLennan. "Tetanus Bacillus recovered from the scar ten years after an attack of post-operative tetanus" *Brit. Med. Journ.* July 2, 1938

tered, by the same route, but we are not aware of any reported recovery after the symptoms noted above have been established.

PAROTITIS

The cause of this complication is not surely known, though some cases may be due to oral sepsis. It probably forms part of a general sepsis, especially when bilateral. It is a remarkable fact that whereas many years ago instances of this complication were not uncommon, it is now very rare, probably owing to the improvement in the technique of surgery. Parotitis is more common in those patients in whom, for some reason, mouth-feeding has been prohibited.

Symptoms.—The condition usually supervenes within the first three weeks and, as a rule, only one gland is affected. The gland is swollen and tender, the temperature and the pulse-rate are raised, the patient is unable to take her food properly, and feels very ill. Occasionally the gland suppurates, and especially is this likely to occur in cachectic and enfeebled patients.

If suppuration takes place there is much constitutional depression with great pain. If the abscess is not opened it may burst into the auditory meatus, or on the cheek or neck; it may track down in the tissues of the neck or ulcerate into the external carotid artery. The gland sloughs, and more or less facial paralysis may exist, and even remain permanent after the inflammatory process has subsided.

Treatment.—In the milder cases, painting with belladonna and glycerin and the application of a wool-pad are all that is required. When the skin becomes dusky these measures should be changed for fomentations, and cautious incisions should be made in lines parallel to the important vessels and nerves of this region. Plenty of stimulants and a liberal diet are necessary, and penicillin or one of the sulphonamide group should be given.

If ulceration takes place into the external carotid artery it will probably be necessary to ligature the common carotid, as the oedema and swelling extend too far down the neck to render it possible to reach the external carotid through healthy tissues.

THRÓMBOSIS OF THE DEEP VEINS OF THE LEG

This complication appears late. On referring to the notes of a considerable number of the cases, we find that in the great majority of them the symptoms developed between the 10th and 14th days after the operation.

Symptoms and signs.—The complication is usually ushered in by pain in the leg, fever, a sallow face, and marked malaise, the condition of the patient before this having perhaps been quite satisfactory. The

leg is very tender when first swollen. The pain precedes the swelling, and is variously localized, usually in the course of the inflamed vein, but sometimes on the outer side of the leg. The swelling may be limited to an enlargement of the thigh, which does not pit on pressure, or there may be œdema of the whole of the leg, or the swelling may be limited to the leg below the knee. After being acutely tender and painful for a few days, the swelling gradually subsides. A relapse may occur, and a tendency to swelling of the leg is left for many months. The most striking thing about this complication is the varied nature of the operations preceding it. Thus, it may occur after abdominal hysterectomy, after vaginal hysterectomy, and after simple incision of the abdominal wall. A left femoral thrombosis may follow the removal of a right ovarian cyst through an abdominal incision, and it may also occur after operations on the upper abdomen and after amputation of the breast. Its occurrence after vaginal hysterectomy shows that it is not necessarily due to a spreading thrombosis of the superficial epigastric veins secondary to some infection through the cut edges of the abdominal wound, for, though this may be one channel of infection, it is evident from its occurrence without an abdominal wound that there must be others. There is no direct communication between the veins in the broad ligaments and the external iliac vein, and, even if there were, it would not explain left thrombosis after right ovariectomy. That it sometimes follows on simple abdominal incision without interference with the pelvic organs and on operations on the gall-bladder and breast is remarkable. Again, it is nearly always the left leg that is affected, though the right, or both, may suffer. In some cases the popliteal or deep tibial veins would appear to be primarily thrombosed. In these cases the infecting agent must have travelled against both venous-blood- and lymph-stream. The whole subject up to now has baffled investigation. It appears to us that the balance of evidence is in favour of a general systemic infection with a local spot of least resistance. It is more especially likely to occur in anæmic women. Whether the œdema be solid or pitting appears to depend on the position of the thrombosis and the length of vein affected; the greater the length, the less possibility is there of collateral circulation being established. Operative ligation of the common iliac vein, of which we have one

that post-operative thrombosis is very rare in the arm. The subject is further discussed under pulmonary embolism (p. 895).

Treatment.—The leg must be kept absolutely at rest. It should be elevated by placing the foot on a pillow, and kept fixed by sand-bags, a cradle being used to keep off the pressure of the bed-clothes. Locally, glycerin and belladonna may be applied with or without superimposed hot fomentations, after which the leg should be firmly but gently bandaged. A high temperature must be treated with quinine or sponging, if necessary, and penicillin or one of the drugs of the sulphonamide group may be tried. The pain may be so severe that morphia is required for its alleviation. There is always a danger of the clot becoming displaced, with resulting pulmonary embolism, and the patient must therefore be warned to keep her leg still. The leg must not be lowered until all pain and fever and most of the swelling have disappeared; it should then be firmly bandaged. It may take many weeks, or even months, before the swelling entirely disappears, and sometimes the leg remains permanently enlarged.

In view of the experimental findings cited above, it is clear that a patient should be encouraged actually to move her legs as soon after the operation as she is able to do so, and that, when at rest, they should be supported by pillows at an elevation of 30 degrees. Post-operative massage of the legs is very helpful, especially where the patient is too feeble to move herself, and Erskine reported a considerable diminution in the frequency of pulmonary embolism following its routine adoption.*

Smith and Allen confirmed the views and practice of Walters†, namely, that thyroid extract increases the speed of flow in the veins and this drug should therefore be given as a routine after all abdominal operations when thrombosis is to be feared. (See also p. 895.)

THROMBOSIS OF THE SUPERFICIAL VEINS OF THE LEG

Thrombosis of the superficial veins of the leg, usually the internal saphenous vein or its tributaries, occurs in the same circumstances as deep thrombosis. It is most likely to affect veins already varicose and is especially likely to occur in patients who have had phlebitis before. The treatment is the same as that detailed in the last section.

EMBOLISM AND THROMBOSIS OF THE FEMORAL ARTERY

We have seen one case of embolism following hysterectomy for fibroids. On the 8th day the left leg became suddenly white and cold; a week later the right leg was similarly affected. A line of demarcation formed in the middle of the thighs 3 days later, and gangrene began

* Brit. Journ. of Obst. and Gyn. Vol. L. ii, No. 5, Oct. 1915.

† Surg. Gyn & Obst. Jan. 1930; L, 154-157

2 days after that. The complication was presumably due to septic endocarditis.

A case of arterial thrombosis occurred after a Wertheim's operation performed by one of us. The external iliac artery was affected, presumably owing to damage received during the removal of the iliac glands. An attempt was made in this case to clear the artery of clot by opening the vessel in the upper part of the thigh and scooping it out with a fine scoop, after which the wound in the vessel was stitched up. It did not succeed.

MESENTERIC THROMBOSIS

This is a rare complication. When the area of thrombosis is small the symptoms of intestinal obstruction are simulated up to a point. Thrombosis of the trunk of the superior mesenteric vein produces the most violent symptoms, very much resembling acute intraperitoneal hæmorrhage. The peritoneal cavity does in fact in these cases contain a considerable quantity of free blood. Blood is also poured into the bowel and, travelling downwards, may escape through the anus.

THROMBOSIS OF THE INFERIOR VENA CAVA

We have seen two examples following hysterectomy. The first patient died suddenly after 3 days' fever. The cava and ovarian veins were thrombosed. In the second, the symptoms were slower, with œdema of both legs, a peculiar bronzing of the skin and, later, vomiting. The cava contained organized clot, and 18 inches of ileum were gangrenous from thrombosis of the mesenteric veins.

ACUTE DILATATION OF THE STOMACH

This is a rare complication. Of 44 cases collected by Campbell Thomson in his book on the subject, no less than 12 were associated with surgical operations, but of these 12, only four followed an abdominal section. In severe cases, acute dilatation of the stomach is one of the most dangerous complications.

The **symptoms** are usually sudden. The patient complains of discomfort and fullness in the abdomen, the temperature falls, the pulse-rate rises, the urine becomes scanty or suppressed, and death may occur in a few hours. An examination of the abdomen shows that it is distended, and a sense of fluctuation and a succussion splash may often be obtained. The onset is soon followed by the vomiting of large quantities of greenish fluid. The condition is primarily paralytic, due probably, as Campbell Thomson said, to the circulation of poisons derived from the alimentary canal or some acute infection. It may be the terminal result of paralytic obstruction (*see* p. 849).

We have had one example of this complication. The patient seemed

to progress quite satisfactorily for two days, when she was suddenly seized with acute abdominal pain, due to what she described as "a fullness of the stomach." An examination showed the abdomen to be very distended but not tender, and the stomach very dilated. The temperature was just above normal, the pulse-rate considerably faster than the temperature warranted. In a few hours the patient had vomited 9 pints of a greenish fluid. The stomach-tube was used and 3 pints of this fluid were drawn off. For a few days the stomach-tube was used every 4 hours, the amount withdrawn being gradually less, and the distension subsiding, till at length the stomach became normal. Strychnine was also given. Unfortunately, as the patient was convalescing, bronchitis supervened and terminated fatally. At the post-mortem examination the stomach was found natural in size, and there was not any peritonitis.

With regard to **treatment**, continuous gastro-intestinal suction must be started at once with continuous intravenous glucose saline infusion. This is most successful (*see p. 857*). Strychnine, acetylcholine and prostigmine should be given hypodermically.

HICCUGH

Hiccough may be due to some inflammatory condition of the abdomen, such as peritonitis, appendicitis, or intestinal obstruction. It may be due to gastritis, to flatulent dyspepsia, or to an overloaded stomach; or it may be an indication of some general disease, such as diabetes or chronic nephritis. It occasionally complicates cardiac failure, pneumonia, and pleurisy; while sometimes it is present with a cerebral tumour. Often a cause cannot be discovered.

In the old days the occurrence of hiccough was considered to be of the gravest import. Probably it gained this sinister reputation from the fact that it not infrequently accompanies general peritonitis. We have, however, frequently seen it more or less marked, quite apart from any grave abdominal complication, and it is generally in these cases due to some gastric disturbance. In one case we remember hiccough continuing for 3 days and nights before it was relieved.

Treatment.—Many remedies may have to be tried before relief is obtained. Among these we may mention warm applications to the abdomen, freezing the skin in the epigastric region, or along the neck in the course of the phrenic nerve, with the ether spray. Holding the breath, strong traction on the tongue, taking a little snuff to induce sneezing, are remedies which at times are successful. Drinking water from a glass with the mouth applied to the distal part of its circumference, thus necessitating flexion of the trunk, will at times succeed when other measures have failed. Of drugs, aromatic spirits of ammonia, a little neat brandy, morphia, nitro-glycerine, ergot, or turpentine may be prescribed.

If hiccough is due to gastric disturbance, the stomach may be washed out or an emetic given, if other remedies fail.

HÆMORRHAGE FROM THE STOMACH AND PERFORATION OF A GASTRIC OR DUODENAL ULCER

Slight degrees of hæmatemesis not infrequently occur after abdominal section for pelvic disease. The vomit resembles coffee-grounds in colour and appearance, and the blood is probably due to capillary oozing from the congested stomach-wall. Particular treatment is not required for such a form of hæmatemesis (*see* p. 823).

Occasionally severe hæmorrhage may occur, which in some cases is certainly due to an ulcer of the stomach or duodenum, for ulcers have been found post mortem. In a good number of cases on record a perforation of the ulcer has occurred. Hæmorrhage or perforation in a patient suffering from gastric ulcer is probably brought about either by (a) congestion of the stomach-wall produced by the anæsthetic; (b) the effort of vomiting; or (c) the flatulent gastric distension that so often occurs after abdominal section. If the ulcer perforates, the patient will become collapsed, very severe abdominal pains will supervene and the abdomen becomes rigid. In addition the abdomen is tender and there will be resonance over the lateral aspect of the liver.

Treatment.—The treatment is that of hæmorrhage from or perforation of these ulcers in circumstances unconnected with abdominal section.

HÆMORRHAGE FROM THE BOWEL

The passage of blood from the bowel after an abdominal section is rare. When it occurs it is due either to some local injury to the bowel, mesenteric thrombosis, gangrene of the bowel, ulcerative colitis, or to an ulcer of the duodenum or stomach.

The subject of operative injury to the bowel has already been dealt with (p. 782). Of ulcerative hæmorrhagic colitis we have met with one example. The symptoms came on some days after the operation, and were those of a foul-smelling diarrhoea, mixed with increasing quantities of blood and sloughs, which treatment did not alleviate. At the post-mortem examination the whole of the large intestine was found to be the seat of deep multiple ulceration.

Treatment.—Should we encounter another case of ulcerative colitis we should perform cæcostomy. The treatment of gastric ulcer has been discussed. Should a duodenal ulcer be diagnosed, an operation for its cure may be indicated or the patient treated by medical means. The subject of gangrene of the bowel demands a separate section.

GANGRENE OF THE BOWEL

It sometimes happens that in the course of an operation a portion of the mesentery may be so damaged that the blood-supply to a certain

length of the bowel is interfered with. This is much more likely to happen when the mesentery of the small intestine is injured, because the vascular anastomosis there is much less free than in the case of the mesocolon. Gangrene is also apt to occur at the point where an end-to-end anastomosis has been performed. The symptoms are those of progressive distension and peritonitis, and in some cases its presence is made clear by the passage of large quantities of blood *per anum*.

Treatment.—The surgeon should be careful, when resecting intestine, not to interfere with the mesenteric blood-supply of the cut ends. Also, when intramesenteric tumours have been removed, the corresponding portion of the bowel must be closely inspected for the purplish hue which indicates that its blood-supply is interfered with, in which case the bowel must be resected.

If, subsequent to the operation, the surgeon diagnoses gangrene of the bowel, and on opening the abdomen finds his diagnosis correct, he must either resect the gangrenous portion and perform an anastomosis, or bring the whole coil outside, cut off the gangrenous portion, and stitch the open ends into the wound.

CONSTIPATION

Almost all patients after an abdominal section suffer from constipation. This is probably due to the altered relations of the parts, the change in the pressure-conditions obtaining in the abdomen, the reclining posture, and the deviation from the natural diet. During convalescence it thus happens that patients, who may never before have had any trouble with their bowels, are now the subjects of constipation.

Treatment.—Constipation in the first week is best relieved by a glycerin enema; after this a daily action may be secured by such purgatives as the patient is usually accustomed to take. In obstinate cases the following prescription will be found very serviceable:

R Ext. casc. sagrad. liq. ℥j
Mag. sulph. ℥j.
Tinct. hyoscyami ℥ss.
Ext glycorrhizæ liq. ℥ss
Aq. ad ℥j.

Dose, 2 teaspoonfuls to 2 tablespoonfuls.

When there is the slightest suspicion that there exists some interference with the free action of the bowel by kinking, pressure, or any other cause of intestinal obstruction, purgatives by the mouth should not be administered.

DIARRHŒA

Diarrhœa after abdominal section is not a common complication, and when it occurs it is of bad omen.

Causes.—Diarrhœa may be due to the following causes :

i. Intestinal obstruction.—When the large intestine is partially obstructed, especially in its pelvic course, diarrhœa frequently occurs, due to the stercoral colitis set up above the seat of stricture. This sign is a very important one, and its significance is apt to be overlooked. The motions passed, always liquid, are small in amount, though the actions are frequent. In deciding whether the diarrhœa is due to obstruction, the surgeon must take into account the relation borne by the amount of material passed *per anum* to that taken *per os*, together with the presence or absence of those other signs of intestinal obstruction which will be found detailed at p. 852.

ii. Pelvic inflammation.—When the pelvic colon is surrounded by an inflammatory mass, such as occurs in pelvic peritonitis or cellulitis following an operation, diarrhœa frequently occurs, and the super-vention of this complication, accompanied by temperature and pelvic pain, should lead one to make a vaginal examination.

iii. Acute ulcerative colitis.—See p. 870.

iv. Sepsis.—Persons dying from generalized sepsis usually exhibit more or less diarrhœa ; the motions are almost unconsciously passed, although the intellect appears active. This form of diarrhœa is a sure sign of impending death.

INJURIES RESULTING FROM RECTAL INJECTIONS

The following injuries may result from rectal injections :

1. The injection may be too hot, and the bowel consequently be scalded.

2. The cone nozzle of the Higginson's syringe, if this instrument is used, has been pushed through the bowel-wall and the enema delivered into the perirectal tissue. The result of this accident is very severe inflammation with necrosis or diffuse suppuration and very possibly death.

3. The bowel-wall may be so attenuated after separation from tumours or inflammatory masses that, though not perforated at the time, it may subsequently give way under the pressure of a large rectal injection.

4. The bowel may have been accidentally opened during an operation, and the sutures closing such openings may burst from the pressure of the rectal injection.

Treatment.—The treatment of these disasters is principally prophylactic. If the nurse takes sufficient care, and nothing more solid than the soft rectal tube be used, the injuries noted under 1 and 2 should not occur. In cases in which the bowel has been damaged, rectal injections should be avoided, except under great necessity. If the

bowel has been ruptured into the peritoneal cavity, the proper course to pursue is immediately to open the abdominal wound, suture the rent if possible, wash out the pelvic cavity, and drain with the patient in the sitting posture. If the perforation is into the perirectal tissues, multiple incisions through the peri-anal skin should be made for drainage, and if the patient's condition will stand it, a temporary colostomy should be performed.

DIAPHRAGMATIC HERNIA

This is a very rare complication but it happened to a patient of one of us and was apparently provoked by the effort of expelling a large enema. Faintness, succeeded by distension and vomiting, ensued, but on opening the abdomen below the umbilicus nothing was discovered. At the post-mortem examination it was found that most of the stomach had passed into the thorax through a gap in the diaphragm.

CHAPTER XXXV

POST-OPERATIVE COMPLICATIONS (Continued)

COMPLICATIONS IN THE ABDOMINAL WOUND

THE complications which may occur in the abdominal wound are hæmatoma, abscess, sloughing, sinus, fæcal fistula, bursting, scar-hernia, and emphysema.

HÆMATOMA

This condition is very likely to arise if trouble is not taken to arrest any sharp oozing at the skin-edge or from the subcutaneous tissues. Also, when suturing the fascial or skin-layer, a vessel may be pricked with the needle, and, escaping notice at the time, give rise to a hæmatoma. A hæmatoma of the abdominal wound is generally discovered when the Michel's clips or skin sutures are removed, although it may occur so late as 10 days after the operation. As a rule, an irregular and sometimes very high temperature accompanies this complication.

A hæmatoma occurring between the peritoneum and the muscular layer of the abdominal wall may, if large, give rise to symptoms of shock out of proportion to the blood effused. The pulse-rate may be very rapid, and the patient be in considerable distress. A diffuse hæmatoma gives rise to crackling almost exactly like that obtained with subcutaneous emphysema.

The best treatment is to open up the cavity and scrape out the clot and, if the cavity be small, to powder it thickly with penicillin-sulphathiazole powder and let it granulate up, which it does rapidly when kept dry. If the cavity be large, it had better be closed anew with silkworm-gut sutures.

"CATGUT BLISTERS"

We coined this term to describe a complication not uncommonly met with when catgut has been used for the buried sutures. Late after the operation, usually in the third week, a purple-coloured elevation is seen in the line of the wound, which on palpation gives the impression of fluid. If it be pricked with a sterile needle, blood-stained serum escapes, often containing fat droplets or small pieces of necrobiotic fat. If the cavity be emptied by pressure, further accumulation may not take place, but in other cases the swelling reforms and needs repuncture. Occasionally the blister ends in suppuration. These

blisters, often mistaken for hæmatomata, are almost certainly due to anærobic organisms in the catgut (*see* p. 21).

The best treatment is to puncture them with a sterile needle after having thoroughly washed them with alcohol and then to express the fluid, repeating the process if the blister fills up again. They do not occur if a really sterile catgut is used.

SUPPURATION

Suppuration of the abdominal wound may be due to the insertion of an infected suture, or to infection of the wound from the air or from the organisms in the patient's skin or abdominal cavity, or to want of surgical cleanliness in the surgeon or his assistants, or to a hæmatoma which has subsequently become invaded by organisms. The abscess may declare itself any time from within a few days following the operation to (in the case of some stitch-abscesses) months afterwards.

The abscess most commonly affects one of the interrupted sutures of the fascial layer, and we believe that the usual route of infection is along the track formed by the sutures uniting the skin. We think that this complication will be seen less often if Michel's clips are used. Fever, without apparent cause, should always awaken suspicion of suppuration round a buried suture. The pulse-rate may increase a little in rapidity, there will be a complaint of pain in the neighbourhood of the wound, and if the wound be examined an indurated or fluctuating swelling will be felt.

When the suppuration affects the continuous suture used for the peritoneum it causes much trouble, for there is a *diffuse* deep-seated induration along the whole length of the wound and multiple sinuses are formed.

Treatment.—The pus must be evacuated so soon as it is detected, and if it is thought to be due to a stitch, this should also be removed, if possible. In most cases the suppuration takes place just beneath the skin, and slightly opening the wound will allow the pus to escape, after which the cavity should be dusted with penicillin-sulphathiazole powder and the wound allowed to granulate.

The most troublesome cases are those of deep-seated suppuration along a continuous suture uniting the peritoneum, especially if the suture be of silk or thread. In such circumstances the pus does not readily come to the surface, the area of induration is *diffuse*, and in many cases a degree of local peritonitis is present as well, with symptoms of a certain amount of interference with the intestine. Such a condition may at first be temporized by the application of hot fomentations in the hope that the inflammatory effusion may subside.

In the event of an incision being necessary, the greatest care should be taken, for omentum always, and intestine commonly, will be found densely adherent to the parietal wound.

When extensive stitch-suppuration has occurred there is a risk of subsequent ventral hernia, and the patient should be made to wear an abdominal belt for a year or two.

Suppuration due to buried sutures of catgut is far less troublesome than that due to silk sutures, for the former absorb, or separate, much more quickly.

If an abdominal wound has suppured and gaped in consequence, it will be found to heal quicker if the separated edges are drawn together as much as possible. This cannot be done satisfactorily by means of strapping applied right across the wound, for the pus fouls it and necessitates its frequent replacement, a process which very soon sets

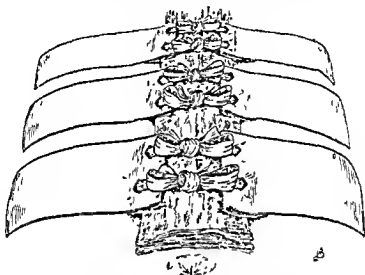


Fig. 604.—Strapping and taping a wound.

up an eczematous condition of the skin. The object in view may be accomplished quite satisfactorily by means of tape and strapping in the following manner: Four or six pieces of strapping, 5 inches long by 2 inches broad, are cut. That end of each which is to be nearest to the wound is overfolded so that the adhesive surfaces are in contact for about an inch. In each of these ends two button-holes are cut. The pieces of strapping are then applied in pairs *vis-à-vis* on either side of the wound, so that the overfolded ends are about an inch distant from the edges of the wound. A piece of tape is now threaded through each pair of button-holes. After the wound has been dressed, each tape is drawn taut and tied, the edges of the wound being thus approximated (Fig. 604).

SLOUGHING OF THE ABDOMINAL WOUND

In operations of a prolonged nature the cut edges of the abdominal parietes become seriously bruised from traction with instruments or

fingers. The resisting power of these parts is, therefore, markedly lowered, and consequently they are very liable to infection. In such circumstances more or less sloughing of the wound may occur, often due to the bacillus of gas gangrene. This complication is particularly likely to arise in patients whose resisting power has been diminished by the cachexia of cancer or the debility of old age (*see p. 403*).

Symptoms and signs.—Owing to the severe nature of the operation in these cases, it must be expected that the patient's pulse-rate and temperature will be raised, but with this complication the temperature will be higher and more irregular than is warranted by the mere operation. Pain in the wound may be complained of, and the wound, when examined, may be found to be tender, red, and swollen. In other cases, however, the skin looks normal in spite of the serious condition of the underlying tissues. In a few days it breaks down along its whole length and an extremely offensive discharge flows from it. The fascial and muscular edges may be found in a state of black sphacelus. It will take weeks for such a wound to granulate up, which it will not do till every hurried suture is discharged.

Treatment.—In all operations performed in the circumstances and under the conditions just detailed, the edges of the wound must be dragged on as little as possible and the operation must be performed as speedily as its nature permits. Covering the wound-edges with sheet rubber, as shown in Fig. 191, is the best method of preventing this complication. If sloughing has taken place the wound must be opened up and peroxide of hydrogen, 10 volumes, should be used to irrigate it frequently. Gauze soaked in the same solution will be found the most useful dressing until the necrosed tissue has separated. Fomentations may then be applied for a few days, and when the area is clean it should be kept covered with lint smeared with boric-acid ointment. Anti-gas-gangrene serum should be administered. It is useless to apply penicillin or sulphathiazole until the sloughs have been separated for they cannot reach the organisms in the necrosed tissue, but so soon as separation has taken place they should be used. When granulation is fairly established, dry dressings and insufflation with aristol should be substituted.

The scar which results after this complication is always a weak one, and the patient must wear an abdominal belt.

ABDOMINAL SINUS

Sinuses can be roughly divided into four classes :

1. Superficial, due to infection of fascial sutures. These are usually single, but on occasion a series may occur, which may trouble the patient for 3 or 4 years if the suture material used was unabsorbable.

2. Those connected with suppuration along the continuous peritoneal

suture. These are multiple, and can be made to communicate with each other by a probe.

3. Those connected with unabsorbable ligatures of pedicles in the pelvis. These are characterized by their great length and very intractable character. They are usually single, and affect the lower end of the wound.

4. Those occurring along the site of an old drain-track, and dependent on some area of necrosed tissue or chronic suppurating surface, such as an imperfectly removed pyosalpinx. They not infrequently mark the site of an old fæcal fistula and are especially common after operations for tubercular salpingitis.

Treatment.—In the first variety it is sometimes easy to pass down a director, feel the suture, and then, after cutting it with a pair of scissors, remove it. At other times, although it can be felt, it is very difficult to remove. One of the best instruments to use for removing the suture is a crochet-hook, and it is surprising how successful this little instrument may be after other methods have failed. Lastly, in many cases the ligature or suture cannot be felt. In these cases, unless the condition is causing much distress, the patient should be advised to wait for some months for natural separation, failing which the sinus should be opened up and the stitch removed.

In the second variety, the length of the suture involved renders its removal difficult unless the whole length of the wound be opened up, though on occasions it is possible to pull it up with a crochet-hook or forceps introduced through one of the sinuses. It is better in most cases to wait a while before opening up the wound, because this is an operation involving a certain amount of danger.

In the third case, if the ligature cannot be pulled up with the crochet-hook, it is better to counsel patience, in the hope that it will spontaneously separate, which it invariably does after a considerable time (perhaps some years). Exceptionally it may be justifiable to cut down upon it. This is often an operation attended by great difficulty and distinct dangers, and should be avoided if possible.

In the fourth case, as a rule, a definite exciting cause of the suppuration which is removable by operation cannot be found. The sinus should, therefore, be left alone, especially in those cases in which a fæcal fistula has previously existed, since there would be a great danger of re-opening the intestine, and in any event the operation is most unlikely to be successful.

FISTULA OF THE LARGE INTESTINE

Cause.—The large intestine may be torn when separating it from a tumour to which it is adherent. If the tear be not recognized, fæcal extravasation takes place, and, if the patient survives, a fæcal fistula results.

If a rent in the wall has been detected and sewn up, a fistula may

appear later from the stitches giving way, and a similar thing may happen after colic anastomosis.

Fæcal fistulæ are more commonly due to sloughing of a portion of the intestinal wall which has been damaged, but not opened, at the time of the operation. The majority of fæcal fistulæ occur after operations for pyosalpinx or tubo-ovarian abscess in which the gut was extremely adherent. It is also often seen after operations for acute gangrenous appendicitis.

Treatment.—As a rule, fæcal fistulæ close spontaneously in a week or two, although they may be as long as 12 months or more in doing so. Beyond keeping the parts clean, immediate treatment is not indicated, for operative closure is always a difficult and often a hazardous procedure. Before any operative attempt is made to close the fistula it should be given at least 12 months to heal. If at last compelled to operate, the surgeon may either cut down upon the fistula, expose it, and endeavour to suture it, or he may perform a temporary colostomy above the seat of the fistula in the hope that by resting the bowel the aperture may be induced to close. The latter is often the preferable course if suppuration is present.

It is our experience that, no matter how desperate the case appears to be, the patient almost invariably recovers who has a fæcal fistula of the large intestine.

FISTULA OF THE SMALL INTESTINE

Fistulæ of the small intestine are not nearly so common as those of the large, because this portion of the gut is much less commonly adherent to pelvic tumours. On the other hand, it is more often adherent to old abdominal scars, the re-opening of which may damage it. We have seen fistulæ of the small intestine and also of the transverse colon developed as the result of a deep abscess of the abdominal wound, first causing adhesion of the bowel to the wound, then shorting into it and finally opening on the abdominal skin. A fistula of the small intestine is a more serious matter than one of the large, because there is not the same tendency to spontaneous closure; the contents are liquid and very irritating to the skin and, lastly, if the fistula affects the upper small intestine, a progressive emaciation results (*see* p. 740).

Treatment.—If a wound is discovered at the operation, it must be carefully sewn up. If a fistula forms and refuses to close spontaneously, three courses are open to the surgeon. The first is to re-open the wound, separate and resect the involved coil of intestine, and perform an end-to-end anastomosis. The second course is to form a lateral anastomosis between the proximal and distal portions of the involved coil through a separate abdominal incision. Thirdly, if the fistula is very small, the edges of the fistula may be rawed and the wound closed by sutures. In most instances the first course is the best.

The discharge from a small intestine fistula is extremely irritant to the skin and the more so the higher up it is. The best preparation to protect the skin is:

R Powdered metallic aluminium, ℥j
Zinc oxide, ℥jss
Liquid paraffin, ℥j

smeard liberally over the area.

ABDOMINO-UTERINE FISTULA

After classical Cæsarean section, if the sutures in the uterus suppurate, a sinus may be established in the abdominal scar and lead down to the uterus. It discharges pus and, at each monthly period, blood.

Treatment.—The fistula may close spontaneously after the sutures have come away by themselves, but if this does not happen it must be opened up and the suture or sutures removed.

BUNSTING

Cause.—In former days, when the abdominal wound was closed with one layer of sutures, it not infrequently happened that during a severe fit of retching, vomiting, or coughing the wound gave way and the intestines protruded. Nowadays, with the method of uniting the abdominal wound in layers, this accident is much rarer, but it still occasionally happens though, as a rule, only a limited portion of the wound gives way. It is most often seen in cases in which the wound is exposed to severe strain from violent coughing or retching, added to flatulent distension, and the majority of the patients are fat and elderly. Though the burst is due to violent strain, the disaster is promoted by: (1) cutting the ends of the knots of the sutures too short, especially if they be catgut sutures, (2) sutures cutting through, (3) too rapid absorption of catgut, and (4) suppuration and sloughing.

Symptoms and signs.—When the entire wound bursts, the patient is seized with a sudden sharp pain, complains of "something" having given way, and shows signs of collapse. In partial bursting complaint may not at first be made, though later increasing rapidity of the pulse and pain in the region of the wound will be noticed. A valuable sign indicating this disaster is the sudden appearance of blood-stained serum soaking through the dressings over the lower end of the wound at a period when ordinary post-operative oozing should have ceased. On lifting up the bandage, a portion of the intestine is found protruding through the separated edges of the abdominal incision. If the accident is discovered early, the gut merely looks dry and is patchily covered with yellow lymph. If it has been long protruded, definite peritonitis may be present.

When tier sutures have been employed it sometimes happens that the burst does not affect the skin-layer. In such a case the diagnosis must be founded upon the discovery of a resonant tumidity along the

area of the wound, or, in the absence of this, bursting may be suspected when, the patient's condition being unsatisfactory, and unusual pain in the wound being complained of, a steady trickle of blood, or a copious discharge of serum, is found to be escaping between the skin-sutures. The possibility of this accident should always be borne in mind, since in most of the cases with which we are acquainted its occurrence was at first overlooked.

Prognosis.—The patient generally recovers; rarely, acute general peritonitis supervenes with a fatal result.

Treatment.—The patient should be anaesthetized, and the protruding intestines, having been carefully cleaned with warm sterile saline solution, should be replaced and the wound resutured. This should be done as strongly as possible with deep through-and-through silkworm-gut sutures to reinforce the buried sutures.

SCAR-HERNIA

Scar-hernia is a much less common complication than it used to be owing to the better healing of wounds consequent on improved aseptic technique. The strength of a median abdominal scar depends entirely on the proper union of the fascia. Scar-hernias occur with increasing frequency towards the pubes; they are comparatively rare above the umbilicus. This is due to the fact that the pressure on the anterior abdominal wall increases from above downwards owing to the weight of the intestines. Feebleness of the tissue of the abdominal wall is also a potent factor, but it must be combined with increased abdominal pressure. Very firm scars are often obtained in patients with attenuated parietes. It is sometimes remarked that scar-hernias more frequently affect medium-sized wounds than very large ones, and this is doubtless due to the fact that the large incision has been necessary to remove a large tumour, with the result that the abdominal tension is very low during the healing of the scar.

Increased abdominal tension is found with obesity, flatulence, chronic cough, or pregnancy, and when one of these conditions exists before an abdominal section, it will predispose to the formation of a scar-hernia.

Direct causes.—Scar-hernia may be due to either of the following causes:

1. One or more sutures may become loose shortly after the operation owing to the knots giving way, the suture tearing out or breaking or, if of catgut, being absorbed too soon. The occurrence of such a hernia is manifest on percussion as a resonant swelling under the skin.
2. Suppuration may take place round one or more stitches soon after the operation, in which case, the fascia in their neighbourhood, not having had time to unite, may separate. Again, the whole wound

may suppurate, and the fascial edges throughout its whole length separate, the abdominal contents, after the skin has given way, being covered merely by the underlying peritoneum or even by adherent omentum only. Such wounds take many weeks to cicatrize, and always leave an extremely weak and papery scar.

3. A large number of cases of scar-hernia occur at the site of a drain-track, especially when this is situated, as it usually is, at the lower end of the wound.

4. The scar may give way many months after an operation, owing to the abdominal distension associated with pregnancy, ascites or the rapid accumulation of intraperitoneal fat.

5. As we have pointed out earlier, women who have had an abdominal section should not for several months undertake any duties necessitating heavy strain, as this is likely to cause the scar to stretch. It is among the poor, to whom this advice is more or less a counsel of perfection, that scar-hernias are most common.

6. There can be no doubt that, apart from suppuration, the wounds of very obese patients tend to heal badly.

Prophylaxis.—The more careful the surgeon is when suturing the abdominal wound, and the more perfect his asepsis, the less risk will there be of a scar-hernia. When subsequent weakness of the scar is anticipated, the sutures closing the fascial layer should be reinforced by deep through-and-through sutures (*see* p. 281). Care must be taken when suturing the fascial edges to ensure that muscle does not project between them and interfere with their union. The suture material should be sufficiently stout, the liability of the suture to cut out being considerable when a strong but very fine material is used.

The question of the routine use of belts has already been discussed (p. 774).

Treatment.—The anatomy of scar-hernias has an important bearing on their treatment. There are certain cases in which the hernia consists of a diffuse relaxation of the whole breadth of the abdominal wall, and a definite sac is not present. The best treatment for these cases is a well-fitting belt, because the rectus muscles are degenerate and the fascia everywhere is extremely thin and weak. If an operation is undertaken, an endeavour should be made to strengthen the abdominal fascia, either from side to side or from above downwards.

If a sac is present it may consist of skin only or of peritoneum and skin, with or without stretched fascial scar tissue. In a number of cases omentum or intestine or both will be found extensively adherent to the sac wall. Scar-hernias are best treated by operation, which should be undertaken as soon as possible, because it is then much easier. In a few cases, when the patient is very feeble and the hernia very large, it is better not to operate, but to advise a belt.

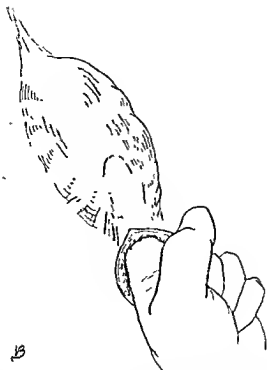


Fig. 605.—Operation for scar-hernia: Exploring the interior of the sac.

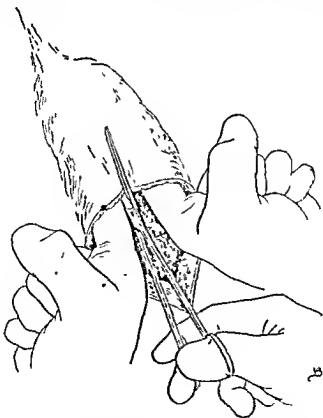


Fig. 606.—Splitting the sac in the middle line.

Preparation of the patient.—See p. 78.

Instruments.—See general list, p. 274.

Operation. i. Opening the abdominal cavity.—Very special care has to be taken when opening the abdominal cavity in these cases. It must be remembered that intestine or omentum is very likely to be

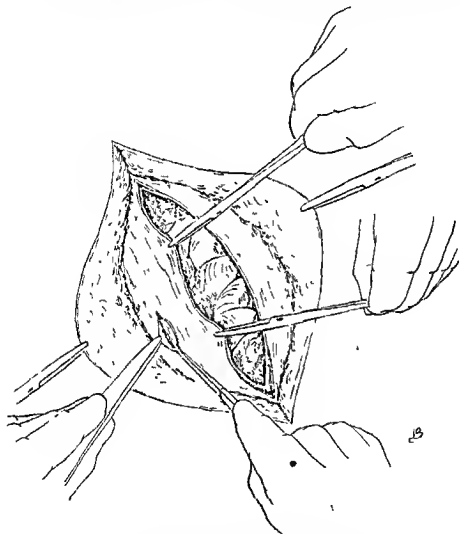


Fig. 607.—Exposing the edge of the rectus muscle.

adherent to the sac of the hernia, and to cut right down through the skin covering it is courting disaster. The skin-incision, therefore, should be begun well above the hernia, and should at first be merely large enough easily to open the abdominal cavity.

ii. Exploring the sac.—The operator next passes his index-finger into the peritoneal cavity through the hole made and the sac is explored (Fig. 605) to ascertain the extent of adhesions, if any.

iii. Separation of adhesions.—If the omentum or intestines are adherent to the sac they must be separated. It is better to resect massive portions of adherent omentum by clamping them with pressure-forceps, dividing and ligaturing them.

iv. Dividing the sac.—The sac is now completely divided with scissors, in the line of the original wound (Fig. 606).

v. Reflecting the skin.—A skin-flap is now turned back on either

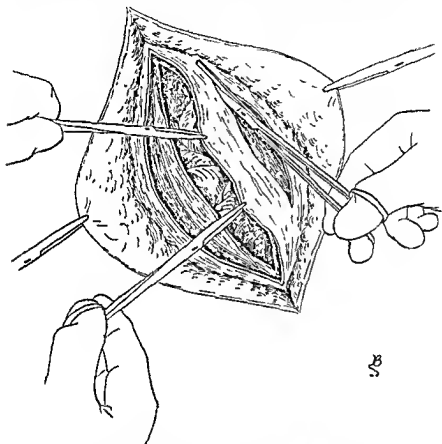


Fig. 608.—Dividing the fascia along the edge of the rectus.

side, so as to expose the underlying fibrous layer, which consists partly of peritoneum and partly of stretched fascia.

vi. Suture of the peritoneum and fascia.—The skin on each side being put on the stretch by means of pressure forceps, the edge of the rectus is felt by means of a finger and thumb, the finger inside the peritoneal cavity and the thumb outside. The edge of the muscle is now exposed by making a small incision through the fascia covering it (Fig. 607). The point of a pair of scissors being passed into the hole made by the incision, the fascia is divided upwards and downwards along the whole length of the hernia (Fig. 608). The edge of the rectus muscle on each side is thus defined and the three layers—peritoneum,

fascia, and skin—are properly demarcated. The same procedure is then carried out on the opposite side. The peritoneum is now closed with a continuous suture (Fig. 609). The layer sutured consists not only of peritoneum but also of the scar tissue of the sac and stretched fascia. Mattress-sutures are now passed through the muscle and fascia, which when tied bring the rectus muscles together in the middle line, which is an important step in the operation (Fig. 610). The edges of the fascia are now brought together by a continuous catgut suture, after which deep

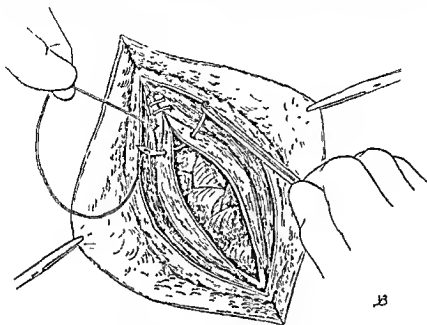


Fig. 609.—Suture of the peritoneum.

through-and-through sutures are inserted through the skin, fat and fascia, under-running the continuous suture already in the fascia.

vii. Cutting away redundant skin and closing the wound.—As much of the skin-flaps as the operator deems proper may now be cut away, after which the subcutaneous fat is brought together by a continuous fine catgut suture and the wound is finally closed by a continuous suture through the skin. After this, the deep through-and-through sutures which, up to now, have not been tied, are tied (Fig. 611).

Difficulties and dangers.—The great point for the surgeon to realize when dealing with a scar-hernia is that there is a deficiency of tissue, although the size of the protrusion with which he may have to deal will tend to make him believe the contrary. For this reason the surgeon should be very chary of cutting away any of the tissues until he is quite certain that there is more than enough tissue to cover in the abdominal contents strongly and easily. It will be noted that in the operation

just described, tissue is not excised until the end of the operation and then only such redundant skin as the operator may think necessary. Some operations for scar-hernia are extremely difficult, owing to the dense adhesions which are present. The greatest care must be exercised, especially when beginning to incise the sac, lest the bowel be wounded. It should be remembered that interstitial prolongations of the sac between the fascia and muscle, or fascia and skin, are often present, and bowel contained in them may be easily wounded while making the various incisions. Before closing the wound a very careful examination should be made of the underlying intestine, in case a hole should have been made in it. Death has followed failure to recognize such an accident.

When the gap between the recti is very broad it may be difficult

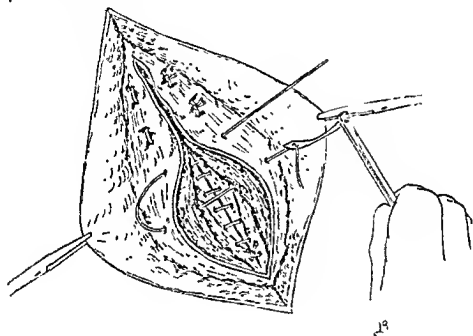


Fig. 610.—Bringing together the fascial edges and the edges of the recti by mattress-sutures.

to bring them together in the mid-line without great tension on the sutures. In such a case the muscles can be mobilized by making incisions through the fascia covering the outer part of the muscles. The relaxing effect of spinal anaesthesia is very helpful.

EMPHYSEMA OF THE ABDOMINAL WALL

Cause.—This condition is usually due to air, which gained entrance to the peritoneal cavity at the time of the operation, being forced thence into the tissues in the neighbourhood of the abdominal incision. It may also be due to entrance of atmospheric air between the skin-

sutures into a cavity that has been left between the peritoneum and the fascia at the bottom of the wound. We have seen emphysema occur, after a wound in the bladder had been sewn up and the bladder continuously drained, because the nurse had forgotten to keep the external end of the catheter submerged in water. Lastly, it may be due to infection with gas-forming organisms, or may result from direct communication with a hole in the intestine.

Symptoms and signs.—The patient may complain of slight pain

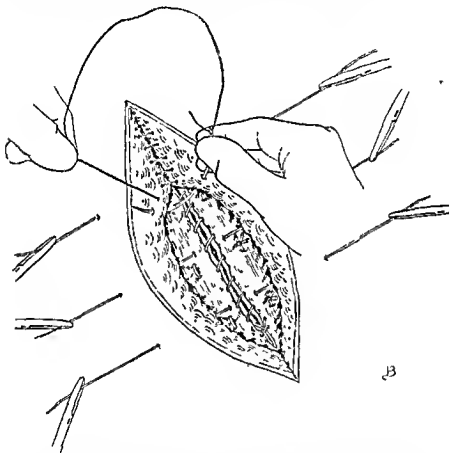


Fig. 611.—Bringing the subcutaneous fat together by a continuous suture, deep through-and-through sutures having been inserted.

but, as a rule, nothing is noticed till the wound is dressed, when a swelling which crackles on pressure is seen in its neighbourhood.

Prognosis.—In the commoner forms the patient recovers in a week or two without any bad symptoms. When, however, the condition is due to *B. aerogenes capsulatus*, the outlook is serious, the wound sloughing, and the patient being profoundly toxic.

Treatment.—Treatment as a rule, is not required, but if there is

evidence that infection has taken place, the swelling must immediately be freely incised and the sloughing tissues irrigated and dressed with a solution of peroxide of hydrogen, 10 volumes (*see* p. 876) and anti-gas-gangrene serum must be administered.

FOREIGN BODIES LEFT IN THE ABDOMEN OR VAGINA

The object most frequently left in the abdomen is a swab. This accident is more likely to happen when the operation has been performed for some sudden emergency. In similar circumstances, large pieces of gauze packing, scissors, forceps, towel-clips, the removable ends of a retractor and other instruments have been left behind. Needles, from their small size, are easily overlooked, while drainage-tubes have not infrequently slipped back into the abdominal cavity subsequent to the operation.

A study of recorded cases shows that although the immediate risks, if the object was sterile, are not great, the final results of this accident are very grave, a large number terminating fatally.

Symptoms.—The symptoms are usually those of definitely local pain and tenderness, and a generally unsatisfactory progress, which the nature of the case does not explain. Not infrequently the real cause has been finally demonstrated by the pointing of an abscess and the discharge of the foreign body through the abdominal or vaginal wound. In less satisfactory cases the sequestered object has been passed by the bowél or retrieved from the bladder. Cases are on record in which such terminations have been postponed for many months or years, the patient meanwhile being in continuous suffering.

The commonest object to be left in the vagina is a swab. Contrary to expectation such a happening is usually not followed by any ill-results to the patient, attention being drawn to the accident by the unexplainable appearance of a foul discharge.

Treatment.—This accident will never occur if the surgeon himself takes the trouble not only to count all the swabs and instruments before and after the operation, but also to make out a list of them beforehand, which can be verified prior to the closing of the peritoneal cavity. In hospital practice it is not fair to burden the surgeon with the responsibility of counting the swabs and instruments, and such duties should be delegated to some responsible person such as the theatre sister or the house surgeon, but the surgeon at least should never forget to make inquiry concerning their number before suturing up the parietal wound.

Before leaving this subject, there are two or three points to which we would draw attention. It is obvious that the more swabs used the greater will be the danger of one being left behind; the operator should therefore endeavour to work with as few as possible, and always to begin the operation with the same number. If the operator is not

having his swabs washed, he should use the original ones as long as possible by squeezing out the blood into a bowl; and if it is necessary to open a second packet, this should contain the same number as the first.

A swab should never be cut in half, this being one of the commonest causes of the accident under discussion. Swabs should never be thrown away until the operation is over and their number verified. The waste-hole of all sinks in operating-theatres should be so guarded as to render it impossible for a swab to get washed down a waste-pipe.

Many a swab has been left behind owing to the operator, after they had been counted, having re-introduced one as a stitch-swab to keep back the intestines while he was securing the abdominal wall.

After delivery of the child and placenta in Cæsarean section, if a hot swab is put into the cavity of the uterus to encourage retraction, it may be overlooked until the swabs are counted before closing the abdomen, when much valuable time may be wasted in hunting for it in the peritoneal cavity. If the swab is left in the uterus it gives rise to sepsis, and the operator, having previously emptied the uterus completely of placenta and membranes, may not again examine the interior of this organ, and the nature of the disaster may only be disclosed *post mortem*.

During the performance of total hysterectomy a swab may be pushed down the vagina and forgotten.

In the course of a vaginal operation there is a special liability to leaving a swab in the vagina not only because the precautions taken against such a happening are, as a rule, much less strict than in an abdominal operation, but because the swabs themselves are much smaller, so that it is easy for the operator to pick up two believing he has only picked up one and then withdraw only one of the pair.

If the surgeon has inserted vaginal plugging and left its removal to the ward sister, he should make quite sure that this has been carried out.

If a swab or instrument is missed, the surgeon, before he searches the abdominal cavity, should have the tumour and the basin containing it examined, lest it be attached to the one or contained in the other. In addition, the wrappings surrounding the patient, and any dirty towels which have been removed, should be carefully inspected. The nurse at times may report that a swab is missing; the surgeon will carefully examine the abdominal cavity and fail to discover it. A recount will show the number to be correct; the nurse has made a mistake. In such a case the surgeon will be well advised not to scold the nurse, whatever irritation he may feel, lest on another occasion when a swab is really missing she may fear to warn him of the accident.

If at some time subsequent to the operation suspicion arises that a metal instrument has been left in the abdomen, the question can be settled by examination with X-rays.

COMPLICATIONS IN THE VAGINAL WOUND

VAGINAL DISCHARGE

Causes.—Troublesome vaginal discharge following a pelvic operation is chiefly seen after total hysterectomy, and sometimes after Cæsarean section, and is due to suppuration round the buried ligatures in the operation-site. It may date from soon after the operation, or may, if silk or thread has been used, only appear after the lapse of some months. The infected ligatures gradually separate and the discharge then ceases, but the process may take some time.

A very intractable form of discharge often flows from the uterus after operations for gonorrhœal pyosalpinx. This subject has already been referred to (p. 659).

Vaginal sinuses exuding pus frequently follow the removal of suppurating Fallopian tubes or ovaries by the vaginal route, and may originate in a ligature, or a portion of the diseased structure which has been left behind—an accident particularly apt to follow these operations.

Occasionally curettage may initiate a chronic purulent discharge, while the sutures used in plastic vaginal operations, such as colporrhaphy, may be responsible for the same thing.

Treatment.—Infected sutures after total hysterectomy may, as a rule, be left to separate spontaneously, the vagina being douched twice daily with Milton solution, three teaspoonfuls to a quart. When, however, the discharge is profuse and distressing to the patient, the sutures should be removed. In most cases they are easily accessible, and can be felt and seen projecting from the granulation-covered scar in the vaginal vault. They can usually be removed without an anæsthetic by the aid of a speculum and a long pair of scissors and forceps. If the patient is intolerant of manipulation, an anæsthetic must be given.

Chronic purulent metritis, after operations for gonorrhœal pus-tubes, is a very troublesome condition. Patience and douching should first be advised, but, if the discharge persists, thorough curettage and the application of a strong chemical antiseptic to the interior of the organ can be performed if the uterus is fairly movable. If it is fixed, or if previous curettage has failed, as it often does, and the discharge is a serious disability to the patient, removal of the uterus by the abdominal route is the proper treatment.

A vaginal sinus following operation on the adnexa by posterior colpotomy had better be allowed a good chance of clearing up of itself. If it fails to do so, and the discharge is making the patient miserable, the condition should be dealt with by abdominal section if there is any suspicion that unremoved portions of the diseased mass are

maintaining the condition. If a ligature is held to be the cause, an attempt to remove it by enlarging the vaginal sinus is permissible.

Purulent discharges following vaginal operations should be dealt with according to their cause—e.g. the removal of an irritating suture.

PROLAPSE OF A FALLOPIAN TUBE

Rarely, after vaginal hysterectomy the end of a Fallopian tube has prolapsed into the vagina through the wound in the vaginal vault, and on the wound healing has become fixed in this position. The slight hydrorrhœa which may result has led to an examination and diagnosis of granulation tissue or carcinoma. The condition does not require any treatment.

HÆMORRHAGE AFTER VAGINAL OPERATIONS

Profuse bleeding sometimes comes on many days after curettage, due to sloughing of a branch of the uterine artery following laceration of the cervix. It should be controlled by plugging the vagina with gauze soaked in 1-in-1,000 flavine. In very rare cases it may be necessary to remove the uterus.

Hæmorrhage after amputation of the cervix is the most definite risk associated with that operation and usually comes on from 10 to 18 days after the operation. It is due to the sutures having cut out or absorbing too soon. Twenty-day catgut should always be used for this operation. In the event of such bleeding, the patient must be anaesthetized and the vagina tightly packed with flavine gauze. This nearly always stops the bleeding and is better than trying to resuture, which is often a very difficult thing to do. If in spite of the packing the bleeding continues, resuture must be undertaken.

Bleeding may also occur after colpo-perineorrhaphy, colporrhaphy, or any other operation involving an incision through the vaginal wall. Flavine packing will usually control it, but packing has the drawback of so distending the vagina that the sutures may be torn out and as a consequence the operative result spoiled. If on examination the sutures cannot be felt to have given way, packing is the best course. If, however, a deficiency can be felt, resuture is best.

After an anterior or posterior colporrhaphy, concealed hæmorrhage may occur under the sutured vaginal wall. This is a serious happening, for the blood forces its way upwards around the bladder or rectum and extravasates beneath the peritoneum, producing great pain, fever and constitutional disturbance. The wound must immediately be reopened and the bleeding vessel secured. Concealed hæmorrhage has been reported as occurring from a uterine artery lacerated during dilatation of the cervix. The effused blood extended under the peritoneum as high as the kidney.

CHAPTER XXXVI

POST-OPERATIVE COMPLICATIONS (Continued)

PULMONARY COMPLICATIONS

AFTER an operation the following diseases of the lungs and pleura may occur, namely, bronchitis, broncho-pneumonia, lobar pneumonia, massive collapse, septic pneumonia, pleurisy or embolism.

BRONCHITIS

This may be, and very often is, due to the anæsthetic administered at the operation, and is then known as ether-bronchitis. It is not always due to ether, however, since it may follow any inhalation-anæsthesia, though ether is the one most likely to cause it. In most cases the patients have already been subject to bronchitis or are so suffering or have only lately recovered from influenza, or some other form of catarrh. It is sometimes due to infection from the mouth-pieces or bags of the anæsthetic apparatus. All competent anæsthetists nowadays wash the face-piece and ether-bag as a routine practice, but when a separate bag is used for the preliminary administration of gas there is sometimes a risk that the anæsthetist may forget to wash it. Paper bags are preferable to those made of indiarubber, as a new bag can be used for each administration.

Operations, except of necessity, should never be performed on patients exhibiting any signs of respiratory catarrh. When the operation is urgent, that form of anæsthesia should be chosen which is least likely to disturb the respiratory tract. The treatment is that common to all forms of bronchitis, irrespective of their cause.

BRONCHO-PNEUMONIA

This is either primary or secondary to a spreading bronchitis. It is characterized by rapid breathing, cyanosis, and absence of air-entrance to the bases of the lungs, over which numerous slight *râles* are heard. Marked inspiratory retraction of the lower intercostal spaces is noticed. Both with bronchitis and broncho-pneumonia the patient may be very seriously ill. The constant coughing not only causes distressing pain in an abdominal wound, but puts a severe strain on the sutures so that a burst wound or a weak scar may result. The wound should always be strapped in such cases. The treatment is the same as that for all forms of bronchitis. Sulphathiazole has a good effect in some cases.

LOBAR PNEUMONIA

Lobar pneumonia sometimes complicates recovery, and the classical signs and symptoms are present. The prognosis does not differ in any way from that of pneumonia in other circumstances, nor does the treatment.

MASSIVE COLLAPSE

Massive collapse of the lungs results from their imperfect expansion. It is due to costal or diaphragmatic paralysis, and is met with occasionally after operations, especially abdominal ones.

In many of these cases sepsis is a factor, but this alone will not explain the common situation of the lesion after abdominal operations, namely, at the bases or along the posterior border of the lungs.

It may be that a prolonged Trendelenburg position is a factor by causing visceral pressure of the diaphragm. Moreover, there is evidence to show that after a laparotomy the function of the diaphragm may be seriously interfered with without sepsis being present and in the absence of marked pain or any indication of lung trouble.

According to William Pasteur, who first described the condition, the illness commences rather suddenly with a short, frequent cough and considerable dyspnoea. As a rule, pain is absent and the fever is only slight. There is loss of percussion resonance, sometimes amounting to dullness, with weak breathing which is often bronchial or tubular. *Râles* may also be present, and crepitations if there is associated pneumonia.

Massive collapse is to be distinguished from post-operative pneumonia, with which it is most often confused, by the rapid onset of the symptoms in the absence of any marked febrile reaction.

The prognosis is good.

SEPTIC PNEUMONIA

This is a blood-borne infection of the lung, and is usually the result of breaking-down thrombi in some of the pelvic veins. The disease begins with rapid breathing and pleural pain, and in most cases a pleural effusion rapidly forms, at times purulent in nature. Elsewhere multiple slight dry *râles* are heard. At first expectoration is absent, but later a little rusty sputum may be coughed up. The prognosis is very bad indeed, but penicillin and the sulphonamides have made it somewhat better. If an empyema forms it will have to be drained.

GANGRENE OF THE LUNG

This rare complication is due either to a septic embolus or to some food being inhaled as a result of vomiting under the anæsthetic.

ACUTE PHTHISIS

Rarely, acute phthisis will follow an operation. We have seen two such cases. It is probably always due to quiescent disease becoming active from the irritation of the anæsthetic.

PLEURISY

On examination of the records of a number of cases of post-operative pulmonary trouble, it is seen that pleurisy forms an appreciable percentage of the total. Pleurisy may be either primary, in which case it is probably embolic, or it may be due to extension from a lobar or septic pneumonia. Effusion may or may not occur. If it does tapping will be required.

PULMONARY EMBOLISM

Pulmonary embolism is the most tragic disaster of all post-operative complications and, as the figures on p. 929 show, is nowadays the commonest single cause of death after abdomino-pelvic operations. It generally occurs from the 10th day onwards, and in most cases follows upon a convalescence which till then had been regarded as satisfactory. We have found on a careful perusal of the temperature charts of these patients, however, that in almost all cases a little unexplained fever preceded the disaster and that the pulse-rate was a little fast. It is a remarkable fact that embolism rarely follows a definite attack of phlebitis and thrombosis, probably because in these cases the clot is so firmly attached to the vein-wall that it cannot readily shift.

The post-operative embolus is probably derived from a vein in which thrombosis has occurred from so slight a degree of inflammation as to leave the wall almost intact and the clot very loosely attached. It is this phlebitis which probably gives rise to the trifling fever and increased pulse-rate we have noted. Such slight phlebitis and thrombosis are particularly apt to occur in patients who have been bleeding seriously for some time before the operation, as, for instance, in exsanguinated women suffering from uterine myomata. The catastrophe is nearly always precipitated by some movement, such as sitting up in bed or endeavouring to rise from a chair; it thus commonly affects patients just about to leave the hospital or nursing-home. The patient is seized with great and sudden pain in the chest, has a sensation of choking, and commences to struggle violently for breath. She quickly becomes blue in the face, unconsciousness rapidly supervenes, and respiration stops, but, though the pulse is so feeble and its rate so fast that it cannot be counted, the heart usually continues to beat for some minutes longer. When, however, the embolus is so large that it entirely blocks the pulmonary circulation, the heart may immediately stop, in which case there is sudden pallor instead of cyanosis, and the patient may be said to die instantaneously. There are, however, many milder

cases in which, with sudden pain and dyspnœa, an area of consolidation of the lung rapidly appears. These must be regarded as examples of pulmonary embolism on a scale not incompatible with life. We have seen cases in which repeated attacks of limited pulmonary embolism occurred and in which the patient eventually recovered. During recovery the sputum is usually bloodstained.

Treatment.—The patient must be placed on her back, given stimulants such as brandy, ether, coramine, camphor, and strychnine by the mouth or hypodermically, and if breathing ceases artificial respiration may be performed so long as the heart continues to beat. If oxygen is available it should certainly be administered, and venesection may be tried if there is marked cyanosis. If the patient recovers from the first violence of the attack, morphia should be given later to quiet the circulation and relieve distress. Operations have been performed to remove emboli from the pulmonary artery, but if a patient lives long enough for this she is, in all probability, going to recover by herself.

The experimental work referred to on p. 866, strongly suggests that a slowing of the rate of venous flow is an important factor in thrombosis and therefore of pulmonary embolism, and the speeding up of the flow by movements and elevation of the legs and administration of thyroid extract is a valuable preventive, but these measures must be applied before thrombosis has taken place, for afterwards the quieter the patient is kept the better.

There is reason to believe, however, that in many cases of pulmonary embolism the embolus comes from one of the pelvic veins, and the extent to which the rate of flow in these is affected by the measures described is not yet known. It appears, moreover, that the condition of the blood itself is another factor of equal importance, either because it contains an agent making for changes in the vein walls, or because it is unduly coagulable. Thrombo-phlebitis is commonly believed to be due in part to bacterial action, and the constitutional disturbance that accompanies it strongly suggests this. On the other hand, no organism can be isolated from the blood in the vast majority of cases of thrombosis, and it may well be that products derived from the thrombus or from changes in the blood generally, are responsible for the toxic manifestations.

On the view that an undue coagulability of the blood is responsible for the clotting, reduction of the coagulation time has been achieved by the use of heparin, with seeming success. A non-toxic crystalline form is now available and is administered by intravenous drip, the aim being to keep the coagulation time between 15 and 20 minutes. There is no standard dose or rate of administration, for the amount necessary varies in different persons, and in the same person at different times, but on the average 20 c.c. or 20,000 units in a litre of normal saline solution is given at the rate of 20 to 25 drops a minute. Its effect must be watched

closely by repeated examinations of the blood and its use should be continued for 10 days.

At present the treatment is so expensive and requires such expert knowledge and constant watching that it is not applicable as a routine, but it may be employed in those patients who, having had one embolism from which they have recovered, are in danger of another. It is stated that 36 per cent. of patients dying of post-operative embolism have previously had one which they survived.*

More recently, a substance named coumarin has been isolated from sweet clover; this also retards blood-coagulation. It has the advantage over heparin that it can be administered orally and, moreover, it has a more prolonged action.

As regards prevention, perfect asepsis in the operative technique is the most important. If a patient continuously exhibits a pulse-rate and temperature slightly above the normal without any ascertainable local cause, subacute pelvic phlebitis and thrombosis should be suspected. Such patients, especially if anæmic, should be kept very quiet and not allowed to get out of bed or make any unnecessary exertion. But even with the greatest care the terrible catastrophe of pulmonary embolism is not altogether to be avoided.

Of recent years it has been urged that the thrombosis antecedent to the embolism is caused by, or at least favoured by prolonged quiescence after the operation, and early movement and early rising are advocated. While agreeing that there is no sense in keeping a patient immobile, we doubt whether quiescence is a major factor in the disaster, for its frequency varies immensely according to the nature of the operation. Perusal of the statistics set out in Chapter xxxviii shows that of the fatal cases the incidence is highest after Wertheim's operation—0.9 per cent. Then follows total and subtotal hysterectomy—0.5 per cent.; myomec-tomy—0.4 per cent.; ovariectomy—0.35 per cent.; salpingo-oöphorec-tomy—0.1 per cent.; repair operations for prolapse—0.1 per cent.; and operations for fixation or suspension of the uterus—0.06 per cent.

Excluding Wertheim's operation, the average length of time that the patient stays in bed is much the same for all the other procedures named, yet the likelihood of fatal pulmonary embolism is 5 times as great after hysterectomy than after operations on the appendages, or repair operations for prolapse. No theory can be accepted unless it explains these facts.

The matter is of special importance at the present time because of the recent view that the embolus almost invariably derives from the veins of the leg, and acting on this theory certain surgeons proceed to ligature the femoral vein on both sides whenever slight fever, not explained by the condition of the operation area, persists during convalescence. We view this practice with great disfavour, and would

* Priestly, Essex & Barker, *Proc. Mayo Clinic*, 1941. Vol. 16, No. 4.

point out that prolonged immobility of the legs (cases of paraplegia, for instance) is not associated with pulmonary embolism. We have been in surgical practice long enough to have seen the rise and fall of several theories about pulmonary embolism, and the arguments adduced in support of this particular one leave us cold. On the other hand, the figures we have given lend strong support to the view that the clot originates from one of the veins tributary to the internal iliac vein on the side-wall of the pelvis. The incidence of pulmonary embolism is peculiar also in this, that a surgeon may appear immune from the disaster for several years and then have two or three cases in quick succession.

FAT-EMBOLISM

This as a complication after abdominal section is very rare, and we have never seen a case. The symptoms and signs described as attending such a condition are cardiac distress and jaundice, followed by hyperæsthesia of the skin on the abdomen and legs, involuntary spasms of the face-muscles, coma, and pleurisy with effusion. In one reported case, on the 5th day following the operation, fat appeared in the urine, and on the 7th day in the blood. The cardiac distress disappeared in 48 hours, and the fat from the urine on the 14th day.

BLADDER COMPLICATIONS

The following complications may occur: retention, painful micturition, cystitis, suppression, incontinence, fistulæ.

RETENTION

Causes.—Retention is due to inhibition of the micturition centre in the lumbar region of the spinal cord, caused by the shock following severe operations, or reflexly from the anticipation of painful micturition, especially after operations dealing with the parts in the neighbourhood of the vaginal outlet.

Retention may also be due to the unaccustomed position; and further, if the patient has been catheterized once or twice, she may, so to speak, get used to the procedure and be unable to pass water normally. If it has been necessary to pack the vagina, the pressure of the gauze may be so great that the urethra is thereby occluded. Lastly, in those operations in which the bladder has to be extensively separated and its relations much altered, as in the radical abdominal operation for carcinoma of the cervix, absolute retention generally results for many days, and partial retention for a week or two longer.

Treatment.—If retention occurs after minor operations, hot fomentations to the abdomen, placing a bed-pan containing a small quantity of very hot water under the patient so that steam shall bathe the parts, bathing the vulva with warm water, a smart purge, or a dose of opium

may succeed in different cases. In the event of their failure, the catheter must be used. If retention occurs after major operations the catheter must be used, because a distended bladder may injuriously affect the operation-site. After an abdominal operation the patient should have passed urine in 20 hours or less. If at the end of this period she cannot do so, the catheter must be used. It should be a rubber one, and of small size. It is to be remembered that a patient may be able to pass urine naturally, and yet not entirely empty her bladder, and that when the relations of the bladder have been much altered by the operation, it is possible to get considerable distension of that viscus without any tumour being palpable through the abdominal wall. Forgetfulness of these two facts may result in great distension of the bladder, with severe abdominal pain, the cause of which is entirely overlooked.

Doryl given by intramuscular injection is sometimes very successful in cases of obstinate retention. If it fails, acetylcholine and prostigmine should be tried. The bladder generally recovers itself directly the patient gets on her feet.

PAINFUL MICTURITION

This may be due to the urine flowing over the injured parts after operations upon or in the neighbourhood of the urethra. It may also accompany peri-vesical inflammation either in the peritoneum or the connective tissue. Lastly, it may be due to cystitis. It is not an uncommon occurrence for pain on micturition to develop about the commencement of the 2nd week after abdominal section, cystitis, secondary perhaps to pyelitis or peri-cystitis, being in most cases the cause.

CYSTITIS

Cystitis is a not uncommon complication after abdominal section, the inflammation of the bladder-wall being usually due to infection by *Bacillus coli communis*, spreading from the site of the operation, or secondary to pyelitis, or careless catheterization. The patient complains of pain about the commencement of the 2nd week, and an examination of the urine shows its reaction to be acid and that it contains a little pus. The mucous coat of the bladder may escape at first, and so the urine be unaffected; but subsequently, when it inflames, pus appears in an acid urine. More rarely the primary infection may be staphylococcal or streptococcal, in which case the urine is alkaline from the first; or, beginning as a colon infection, the cystitis may terminate as a staphylococcal or streptococcal infection, the urine being first acid and then alkaline.

Cystitis may also occur as part of a general urinary infection (see Pyelitis, p. 903), but only primary cystitis is considered here.

Treatment.—In mild cases if the urine remains acid, urotropin in 10-grain doses, taken three times daily, is the treatment first to be tried.

If this fails, cystozol, cystopurin, methylene blue, salol, one of the drugs of the prontosil group, or some other of the large number of urinary antiseptics on the market, are at the surgeon's service. For the more severe cases, especially those in which pyelitis is also present, sulphathiazole should be given. Urinary antiseptics may be obtained now in a form suitable for intravenous injection.

If the urine becomes alkaline and ammoniacal, the bladder should be washed out twice daily with a solution of boric acid, or for intractable cases with a 1 per cent. solution of protargol once a day. Great care must be taken that the temperature of the solution is correct. We know of a case in which a nurse injected a solution so hot that the base of the bladder sloughed, leaving a large fistula.

If urotropin is being given, it should be combined with 25-grain doses of acid sodium phosphate to acidify the urine.

A common method of treatment of *B. coli* bacteriuria is that of large doses of alkalis, but however successful this may have proven in other circumstances, we do not think highly of it when applied to post-operative cases.

SUPPRESSION OF URINE

This condition is due either to ureteral obstruction or to renal shock. In obstruction, both ureters may be included in ligatures or clamps; one ureter may be caught and the opposite kidney fail from sympathetic shock, or the ureter involved may be the only one that is functional. This accident, unless care be taken, is especially likely to occur after vaginal hysterectomy, Wertheim's operation, abdominal total hysterectomy, during the enucleation of broad-ligament tumours, and in the removal of cervical myomata, and it has happened during the performance of anterior-colporrhaphy.

If the only functional ureter or both ureters are occluded, there will not be any urine reaching the bladder, nor will any be passed in suppression due to primary shock.

In the case of sympathetic shock there is a gradual diminution in the quantity of urine passed, blood may appear, and eventually there is complete suppression. The cause of the suppression is acute anæmic degeneration of the cortex. The course of such cases is very characteristic. For several days symptoms may be absent—the so-called tolerant period; this is followed by a condition of high mental distress and nervous irritability, in which the patient may complain of strange and terrible sensations; the pulse-rate is much quickened though the temperature may be subnormal. Finally, the patient becomes comatose and dies.

Treatment.—The urine, after all operations in the neighbourhood of the ureters, should be examined. Clear urine shows that in all probability the ureters are intact. The quantity of urine should always

be measured after such operations, although it must be remembered that the amount excreted for the first 2 days following a severe operation may be very much less than normal.

Clamp-forceps, which have been left on the broad ligaments in vaginal hysterectomy, should be removed at the end of 48 hours in case they include the ureter. If the ureter is obstructed the surgeon must at once adopt such measures as the case indicates. The abdomen has been opened 10 days after an operation, and the ureter freed from the ligature in which it had been included, with successful results.

When the condition is due to acute necrobiosis of the renal tissue caused by shock, or in the obstructive cases after the ureter has been freed, the ordinary measures for suppression must be adopted. The patient should be given large draughts of water, and continuous injections of a 3.3 per cent. solution of sodium sulphate or 10 per cent. glucose (see p. 805) into a vein. The strength of the solution should be diminished as the kidneys recover. To stimulate the kidneys further, the loins should be dry-cupped, the patient placed in a hot-air bath, and one of those drugs that promote diuresis, such as neptal, salyrgan, or novurit, should be administered by intramuscular injection. It is important that there should be no delay in realizing the gravity of suppression of urine or in treating it, since the longer it continues the less the likelihood of re-establishing the function of the kidney. Lastly when all these measures have failed, the kidney may be exposed from the loin and nephrostomy or decapsulation performed, according to whether the suppression is due to obstruction or renal necrobiosis.

INCONTINENCE

Incontinence of urine is most usually due to retention, but it may also be caused by a wound of the bladder or an injury to the ureters.

If retention is the cause, then there may have been carelessness on the part of the nurse in not recognizing or reporting the retention, and on the part of the surgeon in not making himself acquainted with the quantity of urine that was being passed.

The bladder is wounded most commonly during total abdominal hysterectomy. It may also be wounded in vaginal hysterectomy and operations on the anterior vaginal wall such as colporrhaphy, or the enucleation of a cyst or solid tumour. This accident should be detected at the time of the operation and the rent sewn up, but the stitches may give way, leading to incontinence a few days later.

A ureter may be wounded during an abdominal or vaginal hysterectomy or other operation in its immediate neighbourhood in which the vagina is opened. In this case its cut end may become engrafted in the vaginal wound, and the urine will then continuously trickle out of the vagina. The same result occurs in the event of an unsuccessful

uretero-vesical anastomosis. Necrosis of the ureter is one of the recognized risks of the radical abdominal operation for carcinoma of the cervix. As a rule, the escape of urine begins during the first 10 days. Very rarely a uretero-vaginal fistula may develop several months after hysterectomy, in which case it is probably due to an unabsorbed ligature ulcerating into the ureter. In all cases of ureteral fistula there is a great likelihood of sepsis travelling up the ureter and setting up pyelonephritis.

Treatment.—If the incontinence is due to retention, the treatment is obvious. If it is due to injury of the bladder, a catheter should be tied in this viscus, which should then be washed out daily with a solution of boric acid. If the bladder and fistula can be kept aseptic, the latter after a while may heal; if it does not, it must be closed in one of the ways described at p. 155. Water suction should be employed.

When one ureter has been divided, the treatment consists (a) in opening the abdomen, freeing the ureter, and transplanting it into the bladder (p. 777), or (b) if the kidney is disorganized, in removing the kidney. If the fistula is due to sloughing it is better to wait for spontaneous closure as long as possible. If this does not occur, one of the last-mentioned operative measures must be resorted to (*see also* p. 165). These should never be performed until ample time for spontaneous closure has elapsed. Further, if nephrectomy is intended, it is absolutely necessary to be sure that the opposite kidney is healthy. The operator, again, must be most careful, by a cystoscopic examination, to ascertain which ureter is damaged, otherwise he might remove the kidney which is connected with the healthy ureter. Ureteral implantation is at all times preferable to nephrectomy unless the kidney connected with the fistula is disorganized.

Very exceptionally both uterers may be cut and the patient survive. In such an event the ureters should be implanted into the colon (*see* p. 165).

VESICO-ABDOMINAL AND URETERO-ABDOMINAL FISTULÆ

When the bladder, or the ureter, has been injured in the course of an abdominal operation and the wound has been drained, a fistulous track opening at its lower end may subsequently form, if the patient escapes the immediate danger of general peritonitis.

The treatment, if the fistula is quite recent and unassociated with septic signs, would be to re-open the wound and either close the wound in the bladder or implant the ureter. When, on the other hand, the fistula is some weeks old, or is the seat of suppuration, it had better be treated expectantly. Many fistulæ so treated close spontaneously after a while.

RENAL COMPLICATIONS

ACUTE NEPHRITIS

Acute nephritis, after an operation on the pelvic organs, is a rare complication. It is in some cases, perhaps, due to the anæsthetic, in others to sepsis. The patient will complain of headache, dimness of vision, and nausea; her temperature will be raised to 102° F. or over; her pulse-rate and blood-pressure will be increased; there will be œdema of her body, more especially in her hands, face, and feet; and an examination of her urine will disclose a large quantity of albumin, hyaline and cellular casts, while the amount of the secretion will be diminished and the blood-urea raised.

Treatment.—The patient must be treated in the manner described in text books of medicine.

PYELITIS

Causes.—Bacterial infection of the urine causing more or less pyelitis, and sometimes even pyelonephrosis, is one of the commonest complications after abdomino-pelvic operations. The organism most frequently found is *B. coli communis*, but staphylococci and streptococci are not infrequent. The cause is usually obscure. In some cases, but by no means the majority, definite evidence of complications in the operation-area is obtainable, while in others the attack is preceded by signs of cystitis, though, as a rule, the bladder is affected after the kidney. There can be no doubt that a large proportion of the patients who develop pyelitis have been for years *B. coli* passers, with occasional attacks of pyelitis and pyelocystitis. A. Foulerton showed, many years ago, that the mere opening of the peritoneal cavity caused organisms (usually *B. coli*) to appear in the urine within a few days, probably on account of the disturbance effected in the pressure conditions of the peritoneal cavity. This effect of an abdominal operation, superimposed on a urinary tract already the seat of chronic infection, is probably the explanation of the many cases of post-operative bacilluria and pyelitis in which nothing amiss can be found in the operation-area.

Turning to that group of cases in which evidence of the cause is present, pyelitis may be due to suppuration in the neighbourhood of a ureter, or some damage to a ureter or to the bladder in its neighbourhood, and the pyelitis is then unilateral. The ureter may be ligatured or clamped during the performance of hysterectomy, either abdominal or vaginal. It is more likely to be injured during the enucleation of a broad-ligament cyst or the removal of a broad-ligament myoma, and most likely of all during the radical operation for carcinoma of the cervix. More rarely, the ureter may be compressed by an inflammatory exudation in the broad ligament following some operation on that

structure, and we have seen a case in which the compression was due to blood which had oozed from some small vessel in the broad ligament after the removal of a broad-ligament myoma and had then clotted round the ureter. The presence of a ureteral fistula in most cases results in pyelitis and sometimes in pyonephrosis, as do all conditions in which, in addition to an infection of the pelvis of the kidney, more or less ureteral obstruction exists also.

Symptoms and signs.—The patient complains of pain and tenderness in the region of the affected kidney, and perhaps along the course of the ureter. This pain may be more or less continuous or colicky in nature. It is often so severe that morphia has to be administered. The kidney is found to be enlarged and tender. The quantity of urine is, as a rule, diminished, and it contains a certain amount of albumin, and is more or less cloudy, from bacteria and pus cells. The degree of pyuria will depend upon whether the disease mostly affects the pelvis or the substance of the kidney. In the first case there may be sufficient pus to form a well-marked sediment in the urine-glass; in the second case the pus may only just cloud the urine, and its presence be determinable only by microscopical examination. A bacteriological examination usually reveals *B. coli communis*. Again, the amount of pus present will depend upon whether the ureter is compressed or not, and may vary from day to day accordingly. The temperature is, as a rule, fairly high, varying between 101° F. and 103° F. The pulse-rate will be increased and the tongue dry and brown. Rigors are common, and indicate retention of pus in the pelvis of the kidney, during which time the urine passed may be almost free of pus. In the slighter cases, the symptoms may only be fever and the signs some degree of tenderness over one or both loins, associated with more or less cloudy urine.

Prognosis.—The prognosis depends a good deal upon the cause. In the more common type of case, in which a definite cause for the attack cannot be found, the symptoms gradually subside though it may take many weeks before the urine is quite clear. Pyonephrosis in these cases is very rare. When an inflammatory mass is present in the pelvis at the operation-site, improvement will largely depend on the rate of resolution of the mass under treatment. Pyelitis associated with damage to a ureter is always serious. In both these two latter classes of case, pyonephrosis is not unlikely as there is ureteral obstruction.

Treatment.—If the condition is secondary to cystitis, the bladder must be treated on the lines indicated at p. 899. If due to pressure from inflammatory exudation or blood-clot, time must be given for these to be absorbed. If pus forms in the broad ligament, it should be evacuated by the vaginal route and the area drained.

In the usual type of case, in which the operation-area does not

present any abnormality, the drug first to be tried is sulphathiazole or one of the other sulphonamides. If these fail penicillin should be tried. The dose is 0.5 grammes three times a day, and by the end of a week the urine should have become sterile, but if no result is produced the drug should be discontinued and aureomycin or streptomycin substituted. That next to be tried is urotropin, combined, if the urine is alkaline or only faintly acid, with acid sodium phosphate. The diet must be a fluid one and in addition the patient should be made to take several pints of water a day. A mineral water of the Contrexéville type is commonly used, but barley water or plain water are probably as efficacious. If the kidney, or kidneys, are tender and painful the loin, or loins, should be covered with large warm fomentations. There are a large number of urinary antiseptics available if urotropin does not succeed, and one of these may be substituted for it, or alkaline treatment may be tried, large doses of citrate of potassium (gr. xxx) being given every three hours, until the urine is alkaline.

When the case has become chronic, mandelic acid in the form of a compound with calcium called mandecal is very successful. The dose is 2 drachms three times a day and three or four days' treatment usually succeeds in clearing the urine of organisms. We have seen good results from washing out the renal pelves and also from putting the patient on a ketogenic diet. Practically all these patients eventually get well, but are liable, for years, to recurring subacute attacks.

It is very exceptional for a pyonephrosis to form unless there is something in the pelvis obstructing the ureter, and in this connexion it must be remembered that the ureter is nearly always partially obstructed immediately above a fistula. We have seen cases in which abscesses formed in the kidney substance necessitate nephrectomy, and others in which perinephric abscess occurred. Such happenings are fortunately very rare.

HYDRONEPHROSIS, PYONEPHROSIS

Hydronephrosis is due to a partial blocking of the ureter from growth, ligation, or compression of inflammatory products. The blockage is probably not complete but intermittent, since, if the ureter is abruptly clamped or ligated, atrophy of the kidney generally results. The patient complains of pain in the affected kidney and along the course of the ureter of that side; there is an alteration in the quantity of urine, so that at one time the amount will be diminished, and at another markedly increased owing to the escape of urine from the distended kidney. If a local examination of the kidney is made after the passage of the increased quantity of urine, its size will be found to be much diminished, and the patient will suffer less pain and tenderness. As time goes on, if the condition is not dealt with, the patient may show symptoms attributable to renal insufficiency.

Pyonephrosis is due to suppurative pyelitis conjoined with blockage of the ureter. The kidney is much enlarged, very tender, and painful, and the patient has high fever and is very ill.

Treatment.—In hydronephrosis, if there is reason to believe that a ligature has been placed round the ureter, an attempt should be made to remove it, or if an inflammatory mass occupies the broad ligament, this must be dealt with. Pyonephrosis must be met by nephrotomy and drainage, or, in the last resort, nephrectomy.

DIABETES

Diabetes is not to-day a contra-indication to necessary surgical procedures. The choice of anæsthetic is important: local or spinal anæsthesia should be used whenever possible or, failing them, gas and oxygen, and ether, in this order of preference, but never chloroform. The patient should be stabilized in the usual way and not starved before the operation. Two hours before the operation $1\frac{1}{2}$ oz. of glucose in water are given by the mouth and 30 units of soluble insulin injected.

If possible, blood sugar estimations should be made immediately before and after the operation. The urine should be tested every 3 hours, and to facilitate this a catheter may be left in the bladder. During the first 24 hours after operation 6 oz. feeds, consisting of citrated milk diluted by half with water, should be given every 3 hours. If the urine before a feed contains sugar, a further injection of soluble insulin (5 to 20 units) should be given, and if ketone bodies are present $\frac{1}{2}$ oz. of glucose must be added to each feed. This routine should be followed until the patient is fit to be re-stabilized.

DIABETIC COMA

Coma, either hypo- or hyperglycæmic, is a very serious complication, and the possibility is increased by the fact that a patient's insulin requirements may be modified by the operation, especially if it be Cæsarean section. The chief points in making a differential diagnosis are set out below.

Hyperglycæmic coma with ketosis.—The onset is usually gradual, the patient complaining of anorexia, abdominal pain, nausea and vomiting. The breath smells of acetone, and the respirations progressively deepen until, in the final stages, they are deep, rapid, and have a hissing quality. There is tachycardia, a subnormal temperature and subnormal blood pressure and, in addition, flaccidity of muscles, loss of deep reflexes, and softness of the eyeballs. The urine contains sugar and ketone bodies, and the alkali reserve of the blood is low while the blood sugar is high.

Hypoglycæmic coma.—The onset is rapid, and usually related to the pre-prandial period. Hunger pains are complained of, the patient

becoming flushed and trembling. The mental state is characteristically anxious and emotional and mania may be observed ; visual disturbances, especially diplopia, are common. Convulsions may occur and hemiplegia has been seen. Tachycardia is present, but there is no appreciable fall of temperature or blood-pressure. The urine is sugar free, the blood sugar is low and the alkali reserve is normal.

Treatment of hyperglycæmic coma.—In the incipient stage copious fluids should be given by mouth, with added glucose and insulin in the ratio of 2 grammes of glucose to 1 unit of insulin. If ketosis is marked, 50 units of soluble insulin are injected, and 2 oz. of glucose are given. If the patient is unable to take by mouth, 20 to 50 c.c. of 10 per cent. glucose are injected intravenously with the insulin. These quantities may be repeated at intervals until the urine is clear green to Benedict's reagent. If the blood-pressure falls below 90 mm. Hg (systolic) it is essential to give fluids intravenously ; a slow continuous drip is the best form of administration.

Treatment of hypoglycæmic coma.—The patient should always have available some glucose solution to take directly the first symptoms declare themselves. The coma can be relieved by the intramuscular injection of adrenaline, 1 c.c. of 1 in 1,000 solution, or 10 units of pitressin, and the intravenous injection of 20 c.c. of 10 per cent. solution of glucose in normal saline, which should be repeated in half an hour if necessary.

CHAPTER XXXVII

POST-OPERATIVE COMPLICATIONS (Concluded)

MESENTERIC EMBOLISM

THIS is a rare complication after gynecological operations. The results depend upon the size of the vessel embolized.

If a small vessel is affected, the signs and symptoms will be those of ulcerative enteritis or colitis, as set out at p. 870.

If a large vessel is involved, the patient is desperately ill, complaining of great pain and tenderness in the abdomen. Hæmatemesis and profuse loss of blood *per anum* are present, and there are signs of intestinal obstruction and general peritonitis.

Treatment.—The predominant symptoms must be alleviated, but the condition is practically hopeless if the lesion is a large one.

INSANITY

The mental balance of a woman may be disturbed after operations on her genital organs, as after operations on other parts of her body. This is not, however, peculiar to females, for males sometimes become insane after operations. In fact, any shock may be responsible for this condition in a mind weak from inheritance or from some prolonged illness.

In the early days of ovariectomy, hysterectomy, and salpingo-oophorectomy it used to be the fashion for medical men who were antagonistic to these operations to tell women that if they subjected themselves to such they would in all probability become insane; and, in fact, such statements are still occasionally made by well-meaning but ill-informed persons. As we have indicated, it is not because the patient is a woman, nor because certain of her genital organs have been removed, that her mental balance is disturbed. The exciting cause is the shock of a severe operation, comparable, for instance, to the shock of childbirth, acting on an ill-balanced mind predisposed by anxiety concerning the approaching operation, and, in cases in which the ovaries have been removed, by the succeeding climacteric. The natural climacteric itself is responsible for many more cases of disturbance of mental balance than any operation.

An acute toxic insanity is sometimes seen when, either as the result of the operation or because infection was present before it, the patient is profoundly septic.

When insanity follows soon after an operation, it usually takes the form of acute mania.

Treatment.—Such cases are very difficult to treat, on account of the wound, which on the first appearance of symptoms should be so securely strapped that it cannot be disturbed. This is effected by encircling the whole abdomen from front to back with the strapping (see p. 38). The patient must be gently restrained, and two nurses must be in constant attendance day and night. Feeding is often a matter of difficulty, the patient refusing nourishment. She must be persuaded, if possible, and, this failing, the nasal tube must be used. Various drugs may be exhibited, such as medinal, paraldehyde, and the bromides, the first two being the most satisfactory. Opium and morphia, as a rule, are contra-indicated.

Hospital patients must be removed to an asylum as soon as is convenient. Whether or not private patients, who can afford to pay for the services of properly trained asylum nurses, should be sent to a private asylum, is a matter for careful consideration. If they are so sent, the stigma of having been in an asylum is incurred. On the other hand, if the patient is treated at home, she is apt on recovery to insist on leaving the place which is associated with such unpleasant reminiscences. Also it must be remembered that these patients take astonishing likes and dislikes to their nurses, so that the latter may have to be frequently changed, which can be conveniently done only in an asylum.

CEREBRAL THROMBOSIS AND CEREBRAL HÆMORRHAGE

These complications have rarely been noticed to follow a gynæcological operation. If the condition arises during the administration of the anæsthetic, the patient does not recover consciousness after the termination of the operation. On the other hand, the complication may not arise till some little time after the operation, in which case the patient, suddenly or gradually, will become unconscious. The cerebral hæmorrhage may take place during severe straining or violent sickness. The usual symptoms and signs associated with the above conditions will be present, and need not be further detailed.

JAUNDICE

This condition sometimes occurs after abdominal section and, as a rule, it is of serious prognosis, since it is generally the result of delayed anæsthetic poisoning (p. 905), septicæmia (p. 862) or pylephlebitis (p. 864).

CUTANEOUS ERUPTIONS

Various urticarial manifestations may be met with after abdominal section, the commonest of which is an enema rash. This is scarlatiniform,

Occasionally it may be due to an abnormal distribution of the nerve. The result is foot-drop, and partial anæsthesia, from which it will take 3 months to recover.

Treatment.—It is most important for the surgeon to make sure that the patient is properly fixed on the table before it is tilted. A great many nurses are ignorant in this respect. Directly the injury is discovered, foot-drop must be prevented by a sandbag and later on by an apparatus. The general treatment of the paralysed muscles need not be entered into here. It will be found in all text-books of medicine.

On account of the anæsthesia of the sole of the foot, great caution should be observed in regard to hot-water bottles.

Crushes and dislocations.—Unless great care be taken when the patient is being lowered from the tilted to the horizontal position, the hands or arms may be caught between the top of an old fashioned operating table and the frame, resulting in severe bruising, fracture, laceration, or injury to the nerves. The shoulder may be easily dislocated when the patient is under the influence of an anæsthetic unless care be taken, when moving the arms, to avoid over-extension of the shoulder-joint. The accident is most likely to occur when the nightgown, having become soiled, is being changed while the patient is on the table before being put back to bed.

The arms are sometimes adjusted on the operating table so that the hands lie under the patient's body, and a case is on record in which the pressure so caused produced gangrene of the hand. If this method of fixing the arms is adopted, not more than half the hand should be under the thigh and the arm kept quite straight.

In returning from the tilted to the horizontal position, the legs should be kept fixed at right angles. Nurses sometimes incautiously straighten the legs before moving the table, with the result that the patient may slip down and strike her head or dislocate her neck.

Conjunctivitis.—It occasionally happens that the surgeon, on visiting his patient the day following the operation, finds her eyelids red and swollen. On examination, conjunctivitis is discovered, which is usually due either to a drop of the anæsthetic having been allowed to fall into the eye, or to the habit inexperienced anæsthetists have of continually touching the eyeball to ascertain the condition of the patient's reflexes. Conjunctivitis, though very painful and annoying, always clears up in a few days. It should be treated by instilling castor oil and 10 per cent. cocaine, by bathing with boric-acid solution, and by applying cold pads to the eye and boric ointment between the lids to prevent them sticking.

Burns. i. **Anæsthetic burns.**—If the cheeks, lips, and nose are not covered with a thin layer of grease before chloroform is administered,

they may be burnt by the *drug coming* in contact with the skin, and an annoying dermatitis results, disfiguring the patient for a few days.

This condition is best treated by boric-acid ointment.

ii. *Hot-water bottles.*—As we have already pointed out, hot-water bottles, if they are used at all, must be used with the greatest care, for a bad hot-water bottle burn is a disaster of the first magnitude, entailing expense and physical suffering to the patient, mental distress to the surgeon, and liability to legal proceedings against the institution or nurse.

The worst burns are those caused on the operating-table, due (1) to the hot-water bottle which was placed on the table to warm it having been forgotten when the patient was placed in position; (2) to unprotected bottles having been placed against the patient's side throughout the operation, or on the chest in cases of sudden heart-failure; or (3) to contact of the patient with the unguarded metal of an operating-table intentionally heated by hot water. Very serious burns may also result from placing unprotected hot bottles against the patient in bed while she is recovering from the anæsthetic.

There is nothing which it behoves the surgeon to supervise more than the use of hot-water bottles. With modern highly-trained nurses these burns are most likely to occur as the result of over-zeal in an emergency, when, in the immediate necessity for reviving a collapsed patient, the danger of using unprotected bottles is forgotten. We think that hot-water bottles should never be placed on the operating-table, nor do we see any advantage in the use of a table which is artificially warmed. A properly heated room is the best method of avoiding shock in this connexion. After the patient has been returned to bed hot-water bottles should not be used until she has recovered consciousness, unless specially ordered by the surgeon for the purpose of combating shock, in which case he should satisfy himself that they are properly applied and their position constantly supervised.

We have seen bad burns from the use of the electric cradle in cases of shock, the patient in her restlessness bringing some part of her body up against the lamps. All electric cradles should have an inner shield of wire netting to prevent this.

The burn caused by a hot-water bottle is peculiarly destructive, owing to the length of time the heat acts and the depth to which the tissues are consequently involved. When first examined, nothing but an area varying in tint from dead white through bright pink to a rusty purple is seen. Later on, vesicles appear, and presently the whole of the affected area for a thickness of an inch or more may slough out with intense pain, and an extensive disfiguring scar result.

Treatment.—When the burn is discovered, it should be at once covered with lint spread with boric-acid ointment. If vesication takes

place the blister may be pricked. In the event of sloughing, the boric ointment lint should be exchanged for repeated warm boric-acid fomentations until the surface has become clean, when, if small, it may be allowed to granulate up, with the aid of red lotion if necessary, but if large it should be skin-grafted.

Injuries to teeth and gums.—When, during the administration of the anæsthetic, it is necessary, on account of the patient's tongue falling back and interfering with respiration, to open the mouth with a gag and pull the tongue forward with forceps, the gag has been known to force out a tooth, lacerate the gums, or damage an artificial crown. If the forceps is used for any length of time the tongue is always bruised and excoriated.

Falling off the table.—We have already described the dangers that may result from faulty management of the operating table when the Trendelenburg position is used. If the nurse unbinds the ankles before the table is put flat, the patient may slip down and, striking the floor, injure her skull or neck (*see p. 911*). When a patient, fixed in the lithotomy position by Clover's crutch, is pulled down the table, she may be dragged right off it, with very serious results. The anæsthetist and nurses must hold her so that this cannot happen.

COMPLICATIONS CAUSED BY THE ANÆSTHETIC

Chloroform introduced into the stomach.—This accident can only happen with a Junker's apparatus which has been wrongly put together—i.e. when the bulb-tube occupies the position of the delivery-tube, the result being that, instead of chloroform vapour, the drug itself is pumped into the patient's throat. If this accident occurs the patient will probably die.

Circulatory failure.—This complication is predisposed to by (1) any impairment of general health, such as that dependent on anæmia, jaundice, renal disease, shock from injury or loss of blood, and particularly any grave respiratory or cardiac affection; (2) profound mental disturbance; (3) the presence of food or fluid within the stomach. It is excited by (1) embarrassed or arrested breathing; (2) the toxic effects of the anæsthetic itself upon the cardio-vascular system; (3) the surgical procedure; (4) vomiting.

The condition should be treated by lowering the patient's head and by the maintenance of artificial respiration. Injections of coramine, or camphor and strychnine, should be given and ammonia held to the nose. If the heart stops beating it may be massaged through the abdomen if the operation is an abdominal one, and if it is vaginal the abdomen may be opened for the purpose. Adrenaline may be injected directly into the heart (*see p. 831*). Cases are on record in which the cardiac contraction was restarted by this means.

If the circulatory failure is due to shock from hæmorrhage, the head should be lowered, brandy enemata given, and saline infusion, or if it is immediately available, blood-transfusion performed.

Respiratory failure.—Respiratory failure is due to obstruction, paralysis, or reflex inhibition. Obstruction is caused by the tongue falling back, or by muscular spasm, or by foreign substances being sucked into the upper air-passages. Paralysis is due to an overdose of the anæsthetic. Reflex inhibition, causing stoppage of respiration, is specially likely to occur when much traction is being made on the abdominal contents, as for instance during the enucleation of a cervical myoma. It may also be caused by the sudden change of posture occasioned by the assumption of the Trendelenburg position or the packing off the intestines with the big swab.

Obstruction is treated by removal of the cause. If paralysis threatens, the complexion becoming cyanotic, the pulse small and irregular, and the pupil reflex insensitive, the administration should at once be stopped, the lips rubbed with a towel, and expiration assisted by pressure on the chest. If this fails, artificial respiration should at once be started and strychnine administered together with carbon dioxide to stimulate respiration, and oxygen to remove cyanosis.

Reflex inhibition is similarly treated. The surgeon, when performing manoeuvres involving much traction on the abdominal contents, will be well advised to ask the anæsthetist how the patient is bearing it, and, in the event of an unfavourable answer, to desist from his efforts until the breathing is again satisfactory, or to get over the operative difficulty in some other way than by pulling.

Chloroform and ether poisoning.—Delayed chloroform poisoning is not solely due to the effect of that drug, other factors being operative as well, while the same train of events sometimes follows the administration of ether, though much less commonly.

It has been shown experimentally that chloroform, and to a lesser extent ether, affect the cells of the liver lobules in a toxic manner so that the function of the organ is impaired. Clinically it is known that if the urine be examined after the administration of chloroform, acetic and diacetic acid are often found in it, especially in the urine of children.

The presence of these two substances indicates an impairment of the hepatic cells, and is very characteristic of certain grave toxic conditions of the liver, e.g. acute yellow atrophy, phosphorus poisoning, and the toxic vomiting of pregnancy. Moreover, it is known that under conditions of severe septic intoxication and profound shock, the same abnormal constituents appear in the urine.

Under healthy conditions it is doubtful if the administration of chloroform ever produces changes in the liver severe enough to cause

grave symptoms. When, however, a degree of hepatic degeneration due to septic absorption is present before the operation, the administration of chloroform may add to those changes to such a degree that the liver function completely breaks down.

Symptoms.—There are two types of case, the symptoms in each of them beginning, as a rule, within 48 hours of the operation.

In the first, jaundice is a marked feature, accompanied by violent vomiting, a tendency to hæmorrhage, especially from the stomach, and later on by a delirious stupor passing into coma.

In the second, jaundice is absent, but vomiting is persistent. The mental condition is very curious, resembling that seen in cataleptic hysteria; the tongue is dry and black and the pulse very feeble and its rate rapid. Coma eventually supervenes.

Diagnosis.—The urine must be examined for acetic and diacetic acid; leucin and tyrosin may be also present. Jaundice coming on within 48 hours, after an operation not involving the biliary tract, should always be viewed with gravity.

The second and rarer type of case is apt to be mistaken for a hysteroid condition, which it very closely resembles at the outset.

Treatment.—Glucose and bicarbonate of soda should be administered freely by the rectum, an ounce of glucose mixed with 10 ounces of warm water in which a teaspoonful of sodium bicarbonate has been dissolved being introduced through a small catheter and funnel every four hours.

If the patient can retain it in her stomach, a similar mixture may be given by the mouth.

If the condition is grave the same substances should be given by intravenous drip, a drachm of bicarbonate of soda and half an ounce of glucose being added to each pint of water.

When operating for conditions of acute sepsis, ether should always be preferred to chloroform, as being much less toxic to the liver.

Barbiturate poisoning.—As we have already stated (p. 84), the modern basal narcotics belonging to the barbiturate group can act injuriously on the hepatic, renal, and cerebral cells, especially when they are already damaged by toxic absorption.

Symptoms.—The patient, instead of recovering from the anæsthetic, remains deeply unconscious. Examination of the urine is at first negative, but presently reveals albumin, diacetic acid, acetone and other substances indicative of renal and hepatic breakdown. The amount of urine passed gradually diminishes, blood appears in it, and finally there may be almost complete suppression.

Diagnosis.—The profound unconsciousness, continued perhaps for several days, is characteristic. Examination of withdrawn cerebro-spinal fluid will disclose the presence of the drug therein.

Treatment.—Continuous intravenous drip-saline infusion should be carried out to dilute the poison, and the cerebro-spinal fluid should be tapped either by lumbar or cistern puncture, and the tapping repeated as often as may seem necessary. Strychnine in heroic doses, 1 grain repeated, has been lauded as an antidote.* Patients sometimes recover after having been unconscious for several days.

* *Brit. Med. Journ.*, Dec. 16, 1933. p. 1131.

CHAPTER XXXVIII

IMMEDIATE RESULTS OF GYNÆCOLOGICAL OPERATIONS

FOR the proper appreciation of the value of any statistics relating to a particular operation, one must be careful to take into consideration the class of patient dealt with and the conditions under which the operation was performed. Authors when discussing their personal experience of an operation are very apt to base their final judgment of its relative value on a consideration of the results to all the patients upon whom they have performed it, quite irrespective of whether it was performed in a hospital or in private. While it is true that in a well-appointed hospital theatre, with highly trained assistants, an operation is performed in circumstances the best calculated to bring it to a successful conclusion, nevertheless this advantage is more than counterbalanced by the fact that a large proportion of hospital patients are debilitated as regards their general condition and are the victims of neglect as regards the disease for which they are admitted. The physique of private patients is, on the whole, markedly superior and, because they can command efficient medical advice, they, as a rule, present themselves to the surgeon while the disease is in a much earlier stage. We have commented elsewhere upon the importance of recognizing this difference in the class of patient operated upon, and need not here further discuss it.

In this chapter we propose to deal with the immediate results of gynæcological operations, and have taken for this purpose all the more frequently performed operations carried out at the gynæcological department of the Middlesex Hospital and at Chelsea Hospital for Women between May, 1903, and December 31, 1945, a period of 42 years and 8 months. In these statistics we have not included any cases operated upon privately, in order that the results, as already pointed out, may convey a proper impression of the relative danger of operations performed upon a similar class of patient by a number of surgeons working in similar circumstances over a large number of years.

These statistics are, we hope, made more interesting and useful by setting out, in the fatal cases, the cause of death. In the following classification of the causes of death, "shock" has been taken to signify cases in which death took place from a few hours to 3 days or so after the operation, and in which the post-mortem examination did not disclose any definite cause of death. In reports of operation statistics, such cases are often entered up as cardiac failure, cardiac dilatation, syncope, and so forth. We have also included under "shock" those cases in which the patient was practically dying before admission and an operation

OVARIAN CYSTECTOMY*

Disease	Cases	Deaths	Deaths per cent.
For ovarian cysts and solid tumours—Chelsea Hosp. for Women only—1941 to 1946	60	0	0

SALPINGO-OÖPHORECTOMY AND SALPINGECTOMY

Disease	Cases	Deaths	Deaths per cent.
Salpingitis, acute and chronic, pyosalpinx, tubercle, and carcinoma	2088	39	1·8

CAUSES OF DEATH

Peritonitis	15	(4 cases were admitted with general peritonitis)	
Sepsæmia	7		
Intestinal obstruction	4		
Secondary hæmorrhage	3		
Pulmonary embolism	2		
Cardiac failure	3		
Acute tuberculosis	1		
Lobar pneumonia	1		
Tubercular peritonitis	1		
Not stated	2		
	<u>39</u>		

INTRAPERITONEAL SHORTENING OF THE ROUND LIGAMENTS,

Disease	Cases	Deaths	Deaths per cent.
Retroversion—uncomplicated, and complicated with other diseases	1479	6	0·4

CAUSES OF DEATH

Pulmonary embolism			5
Uræmia			1
			<u>6</u>

VENTRALFIXATION

Disease	Cases	Deaths	Deaths per cent.
Retroversion and prolapse	1739	2	0·1

CAUSES OF DEATH

Intestinal obstruction			1
Pulmonary embolism			1
			<u>2</u>

*Under the head of ovariectomy almost all registrars continue to list all operations for the removal of ovarian tumours irrespective of whether they were enucleated or removed with the ovary as well. It is to be hoped that this faulty practice will be amended in the future.

COMBINED OPERATIONS FOR PROLAPSE OF THE UTERUS

<i>Disease</i>	<i>Cases</i>	<i>Deaths</i>	<i>Deaths per cent</i>
Prolapse, treated by Ventralfixation or Shortening of the Round Ligaments, combined with Anterior and Posterior Colporrhaphy and Amputation of the Cervix Uteri	1088	12	1.1

CAUSES OF DEATH

Broncho-pneumonia	4
Pulmonary embolism	4
Intestinal obstruction	3
Shock	1
	<u>12</u>

EXTRA-UTERINE GESTATION

<i>Disease</i>	<i>Cases</i>	<i>Deaths</i>	<i>Deaths per cent</i>
Tubal, intraligamentous, interstitial, ovarian, secondary abdominal	503	13	2.5

CAUSES OF DEATH

Shock	3
Intestinal obstruction	3
Cardiac failure	2
Peritonitis	3
Nephritis	1
Septicæmia	1
	<u>13</u>

CÆSAREAN SECTION

<i>Disease</i>	<i>Cases</i>	<i>Deaths</i>	<i>Deaths per cent.</i>
Antepartum hæmorrhage; contracted pelvis; mal-presentations; medical diseases; obstruction by tumours; ruptured uterus	683	14	2.0

CAUSES OF DEATH

Exhaustion—obstructed labour, 3 and 5 days	2
Eclampsia	2
Shock—uterus ruptured before admission in both	2
Peritonitis	1
Albuminuria of pregnancy	1
Cardiac disease	1
Intestinal obstruction	1
Pyelitis	1
Thrombosis inferior vena cava	1
Following plasma transfusion	1
	<u>14</u>

VAGINAL OPERATIONS

CURETTAGE

<i>Disease</i>	<i>Cases</i>	<i>Deaths</i>	<i>Deaths per cent.</i>
Chronic endometritis, fibroid and mucous polypi, retained gestational products, and for exploratory purposes	8702	13	0·14

CAUSES OF DEATH

Septicæmia (puerperal)	3
Hæmorrhage (post-abortion—case of heart disease which had bled profusely before admission)	2
Pulmonary embolism	2
Syncope (profuse bleeding before admission from a protruding fibroid polypus)	1
Toxæmia (sloughing fibroid polypus)	1
Pertitonitis	2
Uremia	1
Perforation of uterus	1
	<u>13</u>

OPERATIONS ON THE CERVIX UTERI

<i>Disease</i>	<i>Cases</i>	<i>Deaths</i>	<i>Deaths per cent.</i>
Amputation and trachelorrhaphy for chronic cervicitis, hypertrophy, etc	969	1	0·1

CAUSE OF DEATH

Secondary hæmorrhage	1
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DILATATION OF THE CERVIX UTERI

<i>Disease</i>	<i>Cases</i>	<i>Deaths</i>	<i>Deaths per cent.</i>
For dysmenorrhœa, exploration, etc.	1258	3	0·23

CAUSES OF DEATH

Pyometra	2
Not stated	1
	<u>3</u>

ENLARGEMENT OF THE VAGINAL ORIFICE

<i>Disease</i>	<i>Cases</i>	<i>Deaths</i>	<i>Deaths per cent.</i>
*Dyspareunia	569	0	0

INFLATION OF THE FALLOPIAN TUBES

<i>Disease</i>	<i>Cases</i>	<i>Deaths</i>	<i>Deaths per cent.</i>
Testing for sterility	1812	0	0

OPERATIONS FOR FISTULÆ

<i>Disease</i>	<i>Cases</i>	<i>Deaths</i>	<i>Deaths per cent.</i>
Vesico-vaginal and recto-vaginal	149	3	2.2

CAUSES OF DEATH

Acute hæmorrhagic cystitis	1
Pyelitis	1
Uræmia	1
	<u>3</u>

VAGINAL OPERATIONS FOR PROLAPSE

<i>Disease</i>	<i>Cases</i>	<i>Deaths</i>	<i>Deaths per cent.</i>
Including Fothergill's and Le Fort's operation	4299	17	0.39

CAUSES OF DEATH

Cardiac failure	4
Pulmonary embolism	7
Peritonitis	2
Cystitis	1
Diabetic coma	1
Lobar pneumonia	1
Toxic thyroid	1
	<u>17</u>

OPERATIONS ON THE VAGINA AND VULVA

<i>Disease</i>	<i>Cases</i>	<i>Deaths</i>	<i>Deaths per cent.</i>
Vaginal myomectomy	128	0	0
Abscesses and cysts	405	1	0.2
Vulvectomy for carcinoma and leukoplakia	365	4	1.09
	<u>898</u>	<u>5</u>	<u>0.56</u>

CAUSES OF DEATH

Septicæmia	4
Pulmonary embolism	1
	<u>5</u>

OPERATIONS ON THE URETHRA

<i>Disease</i>	<i>Cases</i>	<i>Deaths</i>	<i>Deaths per cent.</i>
Caruncle, urethral cysts and abscesses, etc.	495	0	0

TOTAL ABDOMINAL OPERATIONS

<i>Nature of Operation</i>	<i>Cases</i>	<i>Deaths</i>	<i>Deaths per cent.</i>
Total abdominal hysterectomy	3145	75	2.3
Subtotal abdominal hysterectomy	6585	94	1.4
Abdominal myomectomy	1208	16	1.3
Wertheim's operation	1263	201	15.9
Vaginal hysterectomy	185	4	2.2
Ovariotomy	2333	68	2.8
Ovarian cystectomy	69	0	0
Salpingitis, etc.	2088	39	1.8
Round ligaments—shortening	1479	6	0.4
Ventralfixation	1739	2	0.1
Combined operation for prolapse	1088	12	1.1
Cæsarean section	683	14	2.0
Extra-uterine gestation	503	13	2.5
	22308	544	2.4

TOTAL VAGINAL OPERATIONS

<i>Nature of Operation</i>	<i>Cases</i>	<i>Deaths</i>	<i>Deaths per cent.</i>
Curettage	8702	13	0.14
Operations on the cervix uteri	961	1	0.1
Dilatation of the cervix uteri	1258	3	0.23
Enlargement of the vaginal orifice	569	0	0
Inflation of the Fallopian tubes	1821	0	0
Vaginal operations for prolapse	4299	17	0.39
Operations on the vagina and vulva	888	5	0.56
Operations on the urethra	495	0	0
Operations for fistolæ	149	3	2.2
	17142	42	0.24

TOTAL OPERATIONS PERFORMED

<i>Cases</i>	<i>Deaths</i>	<i>Deaths per cent.</i>
39450	586	1.4

CAUSES OF DEATH—ABDOMINAL OPERATIONS

	Deaths	Percentage of stated cause to Total Deaths
Pulmonary embolism	82	15.1
Shock	74	13.6
Peritonitis	72	13.3
Angina pectoris	1	
Aortic atheroma	1	
Cardiac failure	45	9.2
" disease.	3	
Syncope	2	
Secondary hæmorrhage		48
Intestinal obstruction	40	
Paralytic ileus	5	46
Strangulated ventral hernia	1	
Nephritis	1	
Pyelitis	12	29
Pyonephritis	3	
Uræmia	13	
Acute pulmonary œdema	2	
Bronchitis	1	
Broncho-pneumonia	12	23
Massive collapse	1	
Lobar pneumonia	8	
Septicæmia	18	19
Toxæmia	1	
Pelvic cellulitis—pelvic abscess	9	10
Psoas abscess	1	
Eclampsia	2	
Pregnancy albuminuria	1	
Obstructed labour	2	7
Ruptured uterus	2	
Secondary growths lungs	2	11
" peritoneum	9	
Diabetic coma	5	0.9
Gangrene abdominal wound	3	5
Gangrene bladder	2	
Cerebral embolus	1	3
Cerebral hæmorrhage	2	
Tuberculosis-acute	3	4
" peritoneal	1	
Facial fistula	2	3
Urinary fistula	1	
Acute dilatation stomach	3	0.55
Perforated intestinal ulcer	2	0.36
Thrombosis, vena cava	1	0.18
" femoral	1	0.18
Burst abdominal wound	1	0.18
Epilepsy	1	0.18
Graves' disease	1	0.18
Mania, acute	1	0.18
Exhaustion, cachexia	6	1.1
Anæsthetic	4	0.73
Coagulant, injection of	1	0.18
Following plasma transfusion	1	0.18
Not stated	28	—
	544	

CAUSES OF DEATH—VAGINAL OPERATIONS

	Deaths	Percentage of stated cause to Total Deaths
Septicæmia	3	23.8
Puerperal septicæmia	6	
Toxæmia (sloughing fibroid)	1	
Pyometra	2	
Pulmonary Embolism	6	14.2
Syncope	2	6
Cardiac failure	4	
Cystitis (hæmorrhagic)	2	11.9
Psychitis	1	
Uræmia	2	
Peritonitis	3	7.1
Post abortional hæmorrhage	2	4.7
Diabetic coma	2	4.7
Lobar pneumonia	2	4.7
Toxic thyroid	2	4.7
Secondary hæmorrhage	1	2.1
Perforation of uterus	1	2.1
Strangulation of diaphragmatic hernia	1	2.1
Not stated	1	2.1
	42	

COMPARISONS

In the first edition of this book (1911) the immediate results of operations on the female genital organs were illustrated by the operative results obtained at Middlesex Hospital and Chelsea Hospital for Women from 1895 to 1910.

The figures, from the same hospitals, at present made use of, cover the years 1903 to 1945, but we also have at our disposal those relating to the operative work between 1941-45, which could not be included in the statistics published in the last edition.

Each of these sets of figures forms a cross-section of the average state of gynecological surgery at a particular period, and as such they merit comparison.

As a result two things stand out. the great improvement which has taken place in gynecological surgery as demonstrated by the progressive fall in the operative mortality; and the alteration which has taken place in the numerical (relative and actual) frequency of certain of the common causes of death.

The following tables illustrate the first point :—

TOTAL ABDOMINAL HYSTERECTOMY

Period	Mortality
1895-1910	8.4%
1903-1915	2.3%
1912-1945	1.2%

SUB-TOTAL HYSTERECTOMY

<i>Period</i>	<i>Mortality</i>
1895-1910	4.3%
1903-1915	1.4%
1941-1945	7%

ABDOMINAL MYOMECTOMY

1895-1910	5.4%
1903-1915	1.3%
1941-1945	1.3%

OVARICTOMY

1895-1910	4.7%
1903-1915	2.8%
1941-1945	2.0%

OPERATIONS ON THE APPENDAGES

1895-1910	4.2%
1903-1915	2.0%
1941-1945	1.8%

The second point is illustrated by the following table:—

PERCENTAGE OF CAUSES OF DEATH TO TOTAL DEATHS
FOLLOWING ABDOMINAL OPERATIONS

<i>Causes of Death</i>	1895-1910	1903-1945
States depending on sepsis	26.0%	19.0%
Shock	16.5%	13.3%
Intestinal obstruction	11.0%	8.5%
Pulmonary embolism	6.5%	15.1%
Secondary hæmorrhage	6.0%	8.8%

Sepsis, in one or other of its manifestations, is still the commonest cause of death, though there is a marked improvement over the earlier figures; but the rise of pulmonary embolism from fourth to second place in the later figures is disquieting, because the number of such deaths is not only increased relatively to the total number of deaths but actually to the total number of operations performed.

Thus between 1895-1910 it took 349 abdominal operations to produce one death by pulmonary embolism, whereas from 1903-42 only 272 were required.

We can, however, take some comfort that, in the period 1941-45, only 6 deaths by pulmonary embolism occurred in a series of 2772 abdominal operations, or 1 death to 462 operations, though the numbers are not large enough to base firm conclusions on, the incidence of pulmonary embolism being notoriously erratic.

CHAPTER XXXIX

REMOTE RESULTS OF GYNÆCOLOGICAL OPERATIONS

WHILE the remote results of gynæcological surgery are often brilliant and commonly admirable, in a small minority of cases they are disappointing, and that not from any fault in the technique or failure of the patient to recover immediately from the operation with a satisfactory convalescence.

It must be remembered that the patient may be the subject of some disorder in addition to that present in the pelvic organs, and that an operation, though successful so far as the pelvic condition is concerned, may not entirely alleviate all the symptoms of which she complains.

It is the possibility of this failure to cure, much more than the risk of the operation, that at times deters the experienced surgeon from advocating strongly what he feels is the best treatment.

The surgeon, with the rest of mankind, tends to magnify his successes and minimize his failures. This, after all, is only human nature, and yet a report by a surgeon of his failures would often be of much more value than a whole string of striking success.

The young and enthusiastic surgeon undertakes a case in the almost certain belief of a perfect ultimate result; and if the patient recovers, convalesces, and disappears from his notice, he accounts the case one of his successes. Work in an out-patient department for a few years will lessen such confidence. We do not mean for an instant to question the splendid work and brilliant results of surgeons at the present time, but we do wish to insist on the fact that the mere performance of an operation, although apparently successful, is not always followed by the relief which might reasonably have been anticipated. Although, as we shall see, the surgeon is, in the main, justified in his contention that in the majority of cases a cure results, and in most of the remainder marked relief is obtained from very distressing symptoms, the following may be accounted as some of the failures which occasionally occur in the practice of pelvic surgery in the female:

Peritoneal adhesions.—Peritoneal adhesions remain, recur again, or are formed *de novo* after every intraperitoneal operation. The extent to which they do so depends upon the nature of the operation, the previous condition, and the asepticity or otherwise of the convalescence. The most potent causes of adhesions are post-operative suppuration and

leaving raw oozing surfaces such as are necessarily present, for instance, after the removal of densely adherent pus tubes.

The extent to which adhesions may cause post-operative pain and other disturbances is very variable, for it is no uncommon event to open an abdomen and find most extensive and dense matting of the viscera which has caused neither pain nor interference with the action of the intestine. On the other hand, a very small adhesion, by reason of its peculiar situation, may give rise to much pain or may be the cause of intestinal obstruction.

Thus, a small attachment of the omentum to the stump of a removed Fallopian tube may, by pulling on the transverse colon, occasion pain, dyspeptic symptoms, vomiting, or definite signs of partial intestinal obstruction. Similarly, an adhesion of the pelvic colon just as it crosses the brim of the pelvis to the stump of the left appendage may cause pain and very troublesome constipation.

On the whole, however, we are of opinion that, though post-operative pain is usually ascribed to adhesions, yet they are much less often the cause of it than is generally supposed. It is noteworthy that a large proportion of the patients thus afflicted are of a neurasthenic type whose principal complaint before the operation was pain of a very similar nature. Moreover, though the abdomen be re-opened and the adhesions removed, the woman still complains of pain.

Much judgment is required to decide whether or not to re-operate on these patients.

Scar-hernia.—Hernia due to the stretching of an abdominal wound may be the cause of much suffering, and may not appear until several years after the operation. Most of the patients have put on fat rapidly or are the subject of chronic bronchitic cough. This condition has been fully referred to at p. 881.

We think it is probable that the majority of those patients who suffer from a scar-hernia will return to the institution where the operation was performed. A few will put up with the condition, a few may seek advice elsewhere, but most will return. We found that, during 15 years, 72 patients were admitted to the Chelsea Hospital for Women for an operation necessitated by scar-hernia, and during that time 3,786 patients recovered from an abdominal operation.

Cheloid of the scar.—Very rarely there may be a cheloid development in the scar. The cheloid is, as a rule, not very excessive, and, apart from a slight pruritus and disfigurement, does not cause any trouble. Good results have followed the application of radium.

Endometrioma of the scar*—The accidental transplantation of a piece of endometrium into the abdominal wound may produce a tumour

* Victor Bonney: *Journ. of Obst. and Gyn. of Brit. Emp.*, vol. xxxiii, No. 4, 1926.
Comyns Berkeley: *Ibid.*, vol. xxxiii, p. 657, 1926

which, on section, shows areas of endometrial stroma and glands lying in dense fibrous tissue. The swelling, which takes about two years to form, becomes enlarged and painful with every monthly period. It has followed myomectomy, hysterotomy, abdominal curettage and other operations opening up the cavity of the uterus. It is avoided by covering the wound edges with sheet rubber as shown in Fig. 191. The tumour, once formed, must be excised.

Carcinoma of the scar.—Implantation-metastases rarely occur in the abdominal wound. We have seen a few cases. The condition has generally followed the removal of a malignant ovarian tumour.

Painful scar.—Patients, after the abdomen has been opened, will at times complain of pain in an apparently healthy scar, more particularly if non-absorptive sutures have been used. It is not uncommon for the scar over a ventral fixed uterus to be tender if the abdominal wall is thin.

Abdominal pain.—All abdominal surgeons are familiar with the patient who persistently complains of abdominal pain dating from the operation. The site of the pain is very variable and frequently bears no obvious relation to what was done at the operation. Adhesion is the usual explanation offered, but there is, as a rule, little evidence to support this. A great many of these women are "abdomen centred" and had the same or similar pains before they were operated upon. We have seen cases in which, following the removal of a large tumour, enteroptosis occurred just as it sometimes occurs after childbirth. The tissue irritation due to an unabsorbed or unabsorbable suture or ligature may be a cause of pain.

Constipation and flatulence.—These occasionally give rise to great discomfort, and are sometimes due to adhesions between the intestines, omentum, and parietes. There can also be no doubt that the opening of the peritoneal cavity alters, perhaps permanently, the pressure conditions that have previously obtained there, and it is probable that the flatulence and unpleasant consciousness of intestinal peristalsis that affect all patients more or less for a time after abdominal operations are due to this cause. Wertheim's operation is nearly always followed by persistent constipation, probably because, Douglas's pouch being no longer existent, intra-abdominal pressure on the rectum during defæcation cannot be efficiently applied.

Painful micturition.—It is a well-known fact that many women who have had the catheter passed, even once, after an operation, will complain for a long while afterwards of pain at the end of micturition. A slight degree of basal cystitis revealed by the cystoscope as an area of vascular injection is the usual cause of this. In other cases, adhesions between the bladder and neighbouring parts, or displacement of that viscus are

the cause of this discomfort. Finally, many of these patients are the subjects of chronic bacteriuria, which may date from the operation, or, existing beforehand, has been lit up by it.

Dyspareunia.—After panhysterectomy, and more especially after the radical operations for cancer of the cervix, dyspareunia may occur from shrinkage, shortening or absence of the vagina. When extensive pelvic peritonitis has existed before the operation, or arises after it, permanently tender adhesions in the pelvis may be responsible for the same complaint.

Dyspareunia may also be due to the atrophic condition of the vulva associated with stenosis of the vaginal orifice known as kraurosis vulvæ, which sometimes follows removal of both ovaries. A more important result of that operation in this connexion is the climacteric atrophy of the vagina that it produces. The vagina of a parous woman is large enough to undergo a great deal of shrinkage without causing dyspareunia, but it is quite otherwise with women who have not had children.

Retroversion of the uterus after the removal of the diseased appendages.—It occasionally happens that, some months after an operation for the removal of diseased Fallopian tubes, and more especially if the operation was of a severe nature necessitating the separation of many adhesions and the consequent formation of a raw surface in Douglas's pouch, the patient will return complaining of pain. She has pain on defæcation, dysmenorrhœa, dyspareunia, backache, and perhaps interference with micturition. A vaginal examination discloses the fact that the uterus is retroverted, tender, and fixed. This could have been obviated by ventralfixation of the uterus at the first operation, a procedure we almost invariably follow when dealing with this class of case. This matter is referred to at p. 656.

Failure to cure symptoms.—1. The commonest operation for menorrhagia is curettage; but it is sometimes a disappointing operation, especially in cases in which no thickening of the endometrium is found. It is a mistake, therefore, to hold out too strong hopes with this operation; rather should the patient be warned that, although it is the treatment most suitable to her ease, yet the results are sometimes disappointing.

2. After subtotal hysterectomy slight menstrual losses may occur because a portion of the corporeal endometrium remains, or (in some women) because they menstruate from the cervix. This is of no significance, or may even be of advantage, but to some patients it is an acute disappointment. It rarely continues for more than a year or two, but because of its possibility it is wise to warn a patient on whom subtotal hysterectomy has been performed that it may occur. Very exceptionally, severe hæmorrhages take place from the cervical stump, necessitating its removal.

3. The virginal type of dysmenorrhœa, first-day pain, is usually relieved by dilating the cervix, but in a certain number of cases it fails to do this. It may be that it will be cured at a second attempt, or, on the other hand, it may be incurable by any method short of inducing the menopause by subtotal hysterectomy. It is most necessary, when advising these patients to undergo dilatation of the cervix for dysmenorrhœa, to inform them of the possibility of failure. In all other forms of monthly pain the effect of dilatation of the cervix is extremely problematical.

4. An extensive acquaintance with the operation of ventralfixation for the condition of prolapse, as performed by others as well as ourselves, led us long ago to discard it for the relief of the prolapse complained of, unless combined with colpo-perineorrhaphy, colporrhaphy, or some other plastic operation. Attendance in the out-patient department will disclose women, upon whom this operation has been performed, returning with the statement that they are no better, and an examination will show the cause of their complaint; for whereas the uterus and usually the vaginal vault are fixed in good position, the prolapse of the vaginal walls below the vault remains. There is one exception to the foregoing, namely, cases of pure vault-prolapse in virgins. In this rare condition simple ventralfixation is all that is required.

The return of symptoms.—After a successful operation the symptoms for which it was performed may recur. The following are examples of this misfortune.

1. The fact that during an operation for myomectomy no other myoma can be seen, or felt, does not guarantee that others will not appear later on (*see p. 937*).

2. Many a woman has failed to obtain permanent relief after the removal of a diseased Fallopian tube, or ovary, on one side, owing to that on the opposite side becoming disorganized later.

3. There is no reason why a woman who has had a gestation in the Fallopian tube on one side should not be similarly affected later on in the other Fallopian tube. In about 5 per cent. of the cases the disease occurs on both sides sooner or later.

4. Both the ovaries of a woman may be the seat of tumours, and that at different times.

5. Occasionally the adhesion between the uterus or round ligaments and abdominal parietes due to ventralfixation or ventralsuspension gives way, or so stretches that the operation is a failure.

6. Dilatation of the cervix for the virginal type of dysmenorrhœa, though at first successful, may not be permanently so, the pain returning after the lapse of some months or more. The dilatation should then be repeated.

7. After the successful cure of a prolapse of one part of the vagina another part of it may subsequently give way.

Climacteric symptoms.—If both ovaries are removed, such symptoms as headache, weakness, flushing, sweating, cold sensation, dimness of vision and nausea may be very troublesome and last for several years. These symptoms may come on acutely or by degrees, the former being the most troublesome. A number of preparations, some derived from natural sources and others the product of ingenious synthetic chemistry are now on the market, and are generally successful in relieving the symptoms. It is to be remembered that these are very variable in different women, and often spontaneously disappear for a while and then recur.

Neurosis.—Every surgeon has had experience of the neuroses following operations. Their manifestations are protean; nothing abnormal can be detected, and treatment is not for long of any avail. Tonics, bromides, change of air and scene, high-frequency currents, massage and psychological and rest treatment should be severally tried, according to the peculiarities of the case.

The question of sanity and mental instability has already been discussed (pp. 73 and 908).

Obesity.—Patients sometimes put on weight excessively after gynæcological operations and attribute their spoilt figure to the operation. The only operation that of itself leads to excessive adiposity is removal of both ovaries, and then only in a proportion of the cases. In the vast majority of cases of post-operative adiposity the increase in weight is simply due to the patient's habit of life after the operation. Because she has been told by friends or relatives or by her medical man to "go slowly" for a while, she invalids herself unduly and takes little or no exercise. Her boredom is only broken by her meals, to which, having nothing else to do, she does more than full justice. The result is a rapid increase of weight which makes itself felt by a sense of weakness when she attempts to do anything, and which she wrongly interprets as weakness due to the operation. She therefore invalids herself still more, though she continues to eat as heartily as ever. The result is a vicious circle, the unæsthetic outcome of which she unjustly ascribes to the operation.

Convalescence.—The more ill a patient has been before a successful operation, the sooner, other things being equal, will she be gratified with its results. But after any major operation it is well to impress upon the patient that, even if she makes what is considered a normal convalescence, she will not appreciate its full benefit until the best part of 12 months has elapsed. It takes, roughly, 3 months to recover her physical and mental balance, 6 months to begin to feel the improvement wrought by the operation and 12 months before the new lease of life and

health is fully entered on and the recollection of the illness fades away into the past like the memory of an evil dream.

AFTER-RESULTS OF PARTICULAR OPERATIONS

We finally proceed to discuss the after-results of particular operations, basing our remarks on our personal experience of patients operated upon by us and also of those who, though we did not perform the operation, yet subsequently came under our care.

HYSTERECTOMY FOR MYOMATA OF THE UTERUS

The after-results of hysterectomy carried out for myomata of the uterus are, on the whole, perhaps the most satisfactory in all surgery. The most striking successes are those in which the principal symptom is hæmorrhage, with consequent profound anæmia. In such cases the improvement in the general health is so exceedingly marked that it may be difficult to recognize in a robust and rosy woman the pallid patient of a year ago. When the anæmia is pronounced it takes about this time to re-establish the normal blood-content unless blood transfusion is performed.

If the ovaries have been conserved, or even only one, climacteric symptoms do not follow. The sex sense does not suffer any diminution as a rule, but in women in whom inclination in this direction is founded chiefly, or entirely, on the desire for maternity it may do so because of the knowledge that this is impossible. Many of our patients have subsequently married happily. It has been stated that the normal climacteric supervenes earlier after hysterectomy (Giles). This is not our experience. It is to be remembered that the larger number of hysterectomies for myomata are carried out in women over 40 years of age, who therefore have before them but a few years before they reach the normal climacteric.

We have had, for reasons such as scar-hernia, to re-open the abdomen some years after hysterectomy with conservation of the ovaries had been performed, and the retained ovaries presented the appearances normal to the age of the woman.

Menstruation in a modified degree from the cervical stump after the subtotal operation occasionally occurs, and in exceptional cases the loss may be so excessive as to need the removal of the cervical stump. As a rule, however, it spontaneously ceases after a year or two.

Patients after subtotal hysterectomy sometimes return complaining of a discharge that comes from the cervix. This may originate in an unabsorbed ligature, but usually it is due to a cervicitis which was present before the operation. Cases in which uterine fibroids are complicated by cervicitis are, if the uterus is to be removed, better treated by total hysterectomy.

It is stated that the cervical stump left after the subtotal operation is specially liable to carcinoma. We do not agree with this if the operation is restricted to cases in which the cervix is to all appearance healthy (see p. 235).

Frequency of urination and irritability of the bladder is an occasional sequela and is probably due to that viscus having become adherent to the top of the cervical stump.

HYSTERECTOMY FOR HÆMORRHAGIC AND INFECTIVE CONDITIONS OF THE UTERUS AND DYSMENORRŒA

The remarks just made apply equally to cases of excessive menstrual bleeding from the uterus in the absence of myomata or other growths. The results of the operation are extremely satisfactory.

Subtotal hysterectomy should not be carried out for infective conditions; the removal should be total, otherwise a very troublesome discharge may continue from the cervical stump. We have had on occasion to remove the cervix in these circumstances. This operation should be performed *via* the abdomen, for if attempted *per vaginam* the bladder, which may be adherent to the top of the cervix, is liable to damage.

Hysterectomy cures dysmenorrhœa, no matter what its type, a proof that in all cases the pain, to whatever spot it is referred, has in reality its seat in the uterus.

In one case, after subtotal hysterectomy, menstruation with pain continued from the cervical stump, necessitating its removal.

HYSTERECTOMY FOR CARCINOMA

The ultimate results of Wertheim's operation for carcinoma of the cervix are set out on p. 367. After this operation marital relations are practically impossible, owing to the shortening or absence of the vagina. The removal of both ovaries, which is part of the operation, acts in the same direction. This is a definite drawback to the operation in younger women, but radium also may render marital relations unsatisfactory.

The end-results of hysterectomy for carcinoma of the corpus are very good, the prognosis being best when carcinoma has complicated a myoma. A large proportion of cases of carcinoma of the corpus, estimated at about 70 per cent., are permanently cured.

Cases in which the growth has penetrated almost to the uterine peritoneum, or is accompanied by thickening of the upper part of the broad ligaments, are much graver, and many succumb to secondary intraperitoneal growth. Recurrence may also take place in the vaginal wall, and in this case the secondary growth may be removable, though the chance of permanently arresting the disease is poor.

MYOMECTOMY

The after-results of this operation, when carried out in the manner

we have described in this book, are excellent, and may be considered under the headings of : (1) The effect of the operation on the periods ; (2) The necessity for further operation ; (3) The general health after the operation ; and (4) The outlook for pregnancy and labour.

Of 379 patients operated upon by one of us (V.B.) and whose after-history was followed up for some years, menorrhagia either persisted after the operation or recurred twelve times (3.1 per cent.). Six of these patients (5 of whom had new fibroids) subsequently underwent hysterectomy, 1 was curetted and 2 had intra-uterine polyps removed.

Of the 379 patients, 9 developed new fibroids. It is noteworthy that 7 of these patients were quite young women, their ages varying between 19 and 30. Of these 9, only 4 had to undergo hysterectomy without having become pregnant in the intervals between operations ; one had a child after the myomectomy and then underwent hysterectomy ; one became pregnant and had Cæsarean hysterectomy ; one had a second myomectomy with bilateral enucleation of ovarian blood cysts 9 years after the first, and 4 years later was delivered of a child by Cæsarean section ; while the remaining 2 have not required further operation.

When fibroids occur at such an early age, not only is there much more time for new ones to develop after the operation but a special tendency to the formation of these tumours must be inferred. On the other hand, it is just in such cases that conservation of the uterus is most to be desired.

The general health of the patients subsequent to their operations was good, but 2 were subsequently operated on for endometriomatous cysts, besides those re-operated upon for fibroids or menorrhagia, making 15 patients in all who subsequently underwent a second operation of some kind or other.

Of the 379 patients, 137 were of child-bearing age, married, and wishful to conceive ; of these 52 did conceive, some of them twice and some of them three times. There was only one miscarriage, and most of the deliveries were natural, but the proportion of Cæsarean sections was high, not because natural labour was impossible but because a good many of the women were pregnant for the first time at a relatively advanced age, so that the survival of the child was of more than usual consequence.

To sum up, the proportion of cases in which menorrhagia, or new fibroids, compels eventual hysterectomy is 3 per cent., while of women who have undergone myomectomy within the childbearing age and, being married, desire children after the operation, 38 per cent. may be expected to conceive. Of the children born after myomectomy, some 75 per cent. are born naturally and more could be born so, but for the circumstances mentioned in the last paragraph.

The operative mortality, reckoned on 806 consecutive myomectomies

performed by one of us (V.B.) was 1.1 per cent., or rather lower than that of sub-total hysterectomy.*

OVARIOTOMY

The after-results of ovariectomy vary according to the nature of the tumour removed, and whether or not both ovaries are removed.

With innocent cysts and solid tumours the prognosis is excellent, but with malignant tumours it is otherwise, for recurrence within a short period after the operation is exceedingly common.

The semi-malignant papilliferous cysts are less likely to recur, but even with these return of the growth is the commonest event.

On the other hand, remarkable cases not infrequently are met with in which, although the operation is attended with very dubious chances of permanent success, recurrence does not take place. Occasionally, indeed, irremovable secondary growths, present at the operation, spontaneously disappear after the extirpation of the primary growth.

The malignancy of ovarian growths presenting the outward characteristics, or even the microscopical appearances, of cancer is much more variable than that of histologically similar tumours met with in other regions of the body. Hence it is always worth while attempting to remove these growths, even in cases which seem to hold out little prospect of permanent success.

Many instances are on record in which a second operation for the removal of abdominal recurrence achieved the cure of the patient.

In the remarkable colloid cysts sometimes met with, repeated operations for the removal of the re-accumulating colloid material have often been carried out. We remember a patient whose abdomen was opened 7 times over a period of 10 years.

One-sided ovariectomy has not any effect on menstruation or any other part of the sexual function, provided the remaining ovary is fully functional, which is not always the case, but when the operation is carried out on both sides the effects described in the next section but one may follow.

OVARIAN CYSTECTOMY

The operation of enucleating ovarian cysts and conserving the ovary is a very successful one. One of us (V.B.) has reported a series of 301 of these operations without a death. The tumours removed included all varieties of innocent cysts, and some innocent solid tumours.* Out of 90 patients whose after-history was followed up there was only one patient in whom cysts re-appeared; and this is the more remarkable as among the cysts enucleated were a number of the "chocolate" type, many of endometriomatous origin, in which recurrence might well be

* See "The Technical Minutes of Extended Myomectomy and Ovarian Cystectomy," by Victor Bonney—Cassell & Co., 1916.

expected.* The fact that they do not recur disposes of the reason usually advanced for removing ovaries thus affected. Among this series there were 48 patients of age to conceive and anxious to do so, and of these 16 conceived:—5 after enucleation of blood cysts (2 bilateral); 6 after enucleation of serous cysts (2 bilateral); 4 after enucleation of dermoid cysts (2 bilateral); and one after enucleation of a granuloṣa tumour.

SALPINGO-OÖPHORECTOMY

The removal of one appendage only is not followed by any alteration in the sexual function in the majority of cases, but occasionally menstruation may be irregular or scanty or even cease because the ovary that has been left is deficient in activity (*see also* p. 611).

Giles stated that of a number of women from whom he had removed one appendage, 33—representing 25 per cent. of the married women under 40—subsequently became pregnant. Of these, 17 had full-time deliveries, 5 had miscarriages, 7 had extra-uterine pregnancy, and 2 were pregnant when seen. It would thus appear that after the removal of appendages on one side there is a greater liability to extra-uterine gestation than in normal women. It is to be remembered, however, that a common cause for the removal of the Fallopian tube and ovary, on one side only, is tubal gestation, and in these cases it is undoubted that an abnormal liability to a repetition of the gestation in the other Fallopian tube exists, but whether this liability is also present after removal of one appendage for diseases other than tubal gestation is not established. After the removal of both appendages, supposing the removal of both ovaries is complete, climacteric symptoms will appear in a large proportion of the cases.

The removal of both ovaries before puberty is stated to prevent the development of the normal feminine characteristics. Such cases are extremely rare, but we have personal experience of one such which is worthy of record. The patient when 3 months old was operated upon for a strangulated hernia, and the uterus and both ovaries were removed in a state of necrosis. The patient came under the notice of one of us when she was 19 years old. She was a very pretty girl, entirely feminine in her voice and physique except that her breasts had entirely failed to develop and the shape of her chest was that of a boy. This deformity greatly distressed her and it was in reference to the question whether anything could be done to remedy it that advice was sought. Her sex sense was perfectly normal.

In adult women its effect is remarkably variable, depending partly on the age of the patient; the younger the woman the more likely are symptoms to be produced (*see also* p. 240).

* Victor Bonney: "The Fruits of Conservation." *Journ. of Obst. and Gyn. of Brit. Emp.*, vol. xlv. No. 1, p. 1.

Beyond this, however, another factor is operative, namely, the close interdependence now known to exist between the ovaries and other internal-secretory glands whereby the secretion of the ovary is supplemented, or in some cases perhaps even superseded, by the secretion of the thyroid, adrenal or pituitary glands.

The light thrown in recent years on these interesting subjects at once suggests an explanation of the hitherto unaccountable fact that while the removal of both ovaries from a young woman is in most cases followed by marked climacteric symptoms, in others symptoms do not occur.

Without doubt, the value of the ovaries in the economy is very variable in different women, not only as regards their capacity for producing fertilizable ova, but also as regards their effect generally on the mental and physical characteristics.

The masculine-featured type of woman, sexually and reproductively inert, is well known, but besides these, many women who physically are perfectly feminine are sexual neuters. In either of these two classes the loss of both ovaries will probably have little or no effect.

Giles found that menstruation continued in about 40 per cent. of the patients on whom he had performed bilateral salpingo-oophorectomy, and that of these the largest proportion was in cases in which the operation had been done for inflammatory disease. It is to be noted that it is just in this class of case that the removal of the ovaries is apt to be unintentionally incomplete.

It is, however, certain that in such hæmorrhagic states of the uterus as fibrosis and myomata, removal of the ovaries, though complete, sometimes fails to arrest the periodic or irregular bleeding from which the patients suffer.

Giles also found that when climacteric symptoms appeared after the operation they came on within 3 months in 80 per cent. of the cases, and that their average duration was 3 to 4 years.

Atrophy of the uterus and vagina occurred within 2 years in 62 per cent. of the cases, and within 5 years in 82 per cent. We have found that there is a marked liability to kraurotic changes round the orifice of the canal which, conjoined with the atrophy, quite unfits a woman for married life.

The more profound nervous changes occasionally associated with the natural climacteric occur with the artificial climacteric, but not, in our own experience, with much more frequency. We have seen several cases in which the neuro-vascular symptoms of Graves's disease followed removal of both ovaries. The net result of our experience is that while removal of both ovaries is not infrequently followed by few if any symptoms, yet in general it is highly desirable to conserve as much ovarian tissue as possible, especially in a patient under 45 years of age. The retention of quite a small piece of ovarian tissue appears to be sufficient to prevent climacteric symptoms.

Our experience of autogenous ovarian grafting suggests that the graft, in the majority of the cases, soon ceases to be active (*see* p. 241).

OPERATIONS FOR GENITAL DISPLACEMENTS

Shortening of the round ligaments by the method we now describe has given us better results than those obtained by the operation we used to practice, though those were very good.

In very few cases has the displacement recurred, even after a pregnancy had been passed through. The operation has absolutely no ill effect on pregnancy or delivery, nor is it followed by bladder symptoms. In a certain proportion of cases some pain may be complained of for a few months at the point of fixation of the ligaments to the aponeurosis.

Ventralfixation of the uterus has also given us good results when employed for retroversion, but we have for a number of years now only employed it for this in exceptional conditions, restricting its use chiefly to certain cases of prolapse, in which it is combined with other procedures.

A proportion of the cases experience some frequency of micturition after it (about 15 per cent. according to Giles), and pain and tenderness are sometimes complained of over the area where the uterus has been fixed.

As regards its effect on pregnancy and delivery, on none of our patients, as far as we know, has the operation had any untoward results. This is borne out by Giles's statistics: he found that out of 44 full-time deliveries in patients on whom he had performed this operation, 40 had normal confinements and 4 had complications which were independent of the operation, and he also found that pregnancy and delivery had no subsequent effect on the position of the uterus. It is frequently alleged that the ventralfixed uterus is likely to cause intestinal obstruction. In our very large experience we have never met with this complication in any patient on whom we have operated, but on two occasions we have seen it in patients operated on by other surgeons.

The results of the combined operations for displacements of the genital canal, described in Chapter XXI, are remarkably good, there being, in practically all cases, an increase in well-being and comfort very gratifying to the patient. If the vaginal orifice has been over-narrowed, dyspareunia may be complained of. We have met with one or two cases in which, though at the time of the operation an ample passage was left, yet excessive scar-contraction unduly narrowed it, and others in which reflex spasm of the levatores ani, due to a small sequestered abscess, probably formed round one of the buried stitches, narrowed the vaginal entrance to a marked degree, though the narrowing disappeared immediately the patient was anæsthetized. The spasm ceased after evacuation of the abscess.

Subsequent labour naturally restretches or tears the parts again,

but not by any means necessarily to an extent causing reappearance of the prolapse.

When such a recurrence was specially to be avoided we have performed Cæsarean section and tied the Fallopian tubes.

It is to be remembered that although the part of the vagina operated upon remains firm, it sometimes happens that a new prolapse appears affecting a part of the canal not previously exhibiting it. Thus, after an entirely successful anterior and posterior colporrhaphy, the patient may return some years later with a prolapse of the vault, either entire or affecting its anterior or posterior sections.

CURETTAGE

When performed for excessive bleeding from the uterus, this operation is notoriously variable in its results. The most successful cases are those in which a thickened condition of the endometrium exists, conjoined with a soft enlargement of the whole organ. Such is seen typically in those patients in whom menorrhagia follows a recent labour or miscarriage. On the other hand, when the curette brings but little away and the uterine wall feels hard and woody, there is a very considerable chance that the operation will not cure the excessive loss, or at all events only check it for a time. Menorrhagia of endocrine origin is not cured by curettage. Patients about to be curetted for menorrhagia should be informed that in certain circumstances the operation is apt to fail in its intent.

Curettage performed for the cure of leucorrhœal discharge from the cervix always fails, because it is impossible to eradicate the deeply embedded cervical glands by scraping.

AMPUTATION OF THE CERVIX AND TRACHELORRHAPHY

Amputation of the cervix is the best method of curing leucorrhœal or other discharge from the cervix, because it gets rid of the cervical glands, from which the discharge originates. It is the most usual operation for getting rid of large areas of erosion such as often complicate an old tear, and, further, it is frequently performed in conjunction with other operations for prolapse. It is also the treatment for cervical hypertrophy.

It is stated that removal of the vaginal cervix lessens the chance of conception and favours miscarriage, and probably it does. But in the event of pregnancy the operation does not interfere with labour which, in those cases that have come under our notice, has passed off normally.

Complete or almost complete removal of the cervix certainly lessens the probability of conception and creates, in the event of pregnancy, a marked tendency to premature emptying of the uterus.

Trachelorrhaphy is an unsatisfactory operation when employed for

the cure of discharge originating in the cervix, and we have abandoned it for this purpose. It does not produce any ill results during labour, but the cervix nearly always tears again.

DILATATION OF THE CERVIX

Apart from exploratory purposes, or as a preliminary to curettage, this operation is usually undertaken for the cure of sterility or dysmenorrhœa.

In cases of sterility it is most successful when dysmenorrhœa of the vaginal type complicates the case, or when an abnormal narrowness of the cervical canal exists.

Its results in dysmenorrhœa depend on the variety of the monthly pain. In the "vaginal type"—i.e. that met with in young girls—in which the pain is confined to the centre of the lower abdomen and only endures for a few hours at the onset of the period, its results are good, most of the cases being either cured or greatly relieved. The more, however, the character of the pain deviates from this type, the less satisfactory are the effects of dilatation.

REPARATIVE OPERATIONS ON THE TUBES

The results of these operations are encouraging, especially when it is remembered that in many instances the tubes are not only closed but also have had their epithelial lining damaged by the inflammation which closed them.

Pregnancy followed the operation in 18 per cent. of a series of cases reported by Victor Bonney* ; the successes were equally distributed between cases of external salpingostomy and tubal re-implantation.

The operation should not be undertaken unless the semen has been proved active and the tubal closure confirmed as permanent by two insufflations carried out at intervals, the last occasion being when the patient is on the operating table with a view to opening the abdomen if the second testing confirms the closure.

* The Fruits of Conservation. Victor Bonney, *Journ Obst Gyn Brit. Emp.*, 1937, vol. xlv, No 1, p 1

Epilogue

There is no finality in either Art or Science, and surgery, which is an art waited on by science, is doubly subject to change. The process is less obvious in short retrospect but, viewing it over the forty years which have elapsed since this book was first published, it is surprising how large is the number of methods and opinions which, in the course of that time, have become modified almost out of recognition, or been replaced by new ones, with continual improvement as the net outcome.

We would commend this reflection to any one of our younger readers who, diffident of his own powers, may think that the conscientious performance of the details of his craft, as they have been taught him, is a sufficient task, and that there is nothing he himself can add.

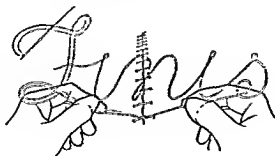
We would remind him that, though the foundations were laid and the great pinnacles raised by certain exceptional men, the bulk of the fabric of surgery has been the work of a multitude of less distinguished but not less devoted labourers, among whom he can, at the least, aspire to range himself; and that if he succeeds in building into the structure one single sound stone, a part of himself will travel down the ages, deathless and forever. The type of mind which registers every experience, and thereafter subjects it to minute examination and constant questioning, can, in large measure, be cultivated; and thence comes discovery—and the more splendidly if the faculty of imagination be possessed as well. There are various roads to success in the calling of surgery, but the pride and pleasure of the true craftsman in his craft is, of all sources of happiness, the most enduring, and though fate and fortune be malign, this remains certain: that, because perfection is impossible, he, dauntless, who steadfastly strives to reach it, will always receive honour.

"Does the road wind uphill all the way?

Yes, to the very end.

Will the day's journey take the whole long day?

From morn to night, my friend."



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